PMM

Precision Metal Molding

APRIL
1956

INCLUDING DIE CASTINGS MAGAZINE

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ANN ARBOR MICH
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devoted exclusively to:

DIE CASTINGS

INVESTMENT CASTINGS

PERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

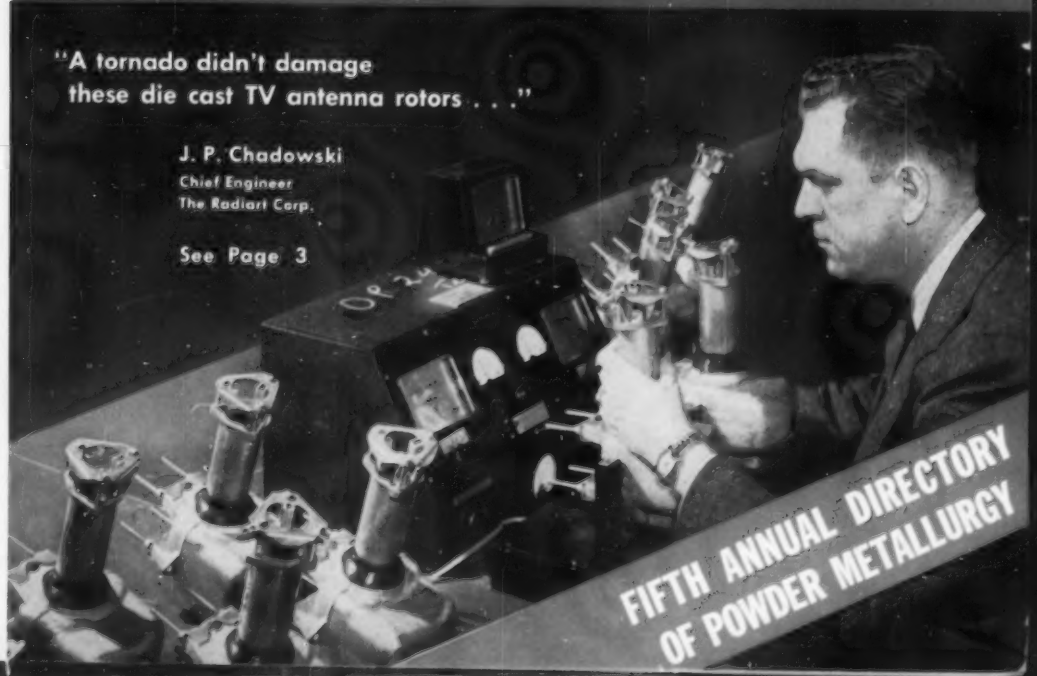
POWDER METALLURGY

SHELL MOLD CASTINGS

"A tornado didn't damage these die cast TV antenna rotors . . ."

J. P. Chadowski
Chief Engineer
The Radiart Corp.

See Page 3



FIFTH ANNUAL DIRECTORY OF POWDER METALLURGY

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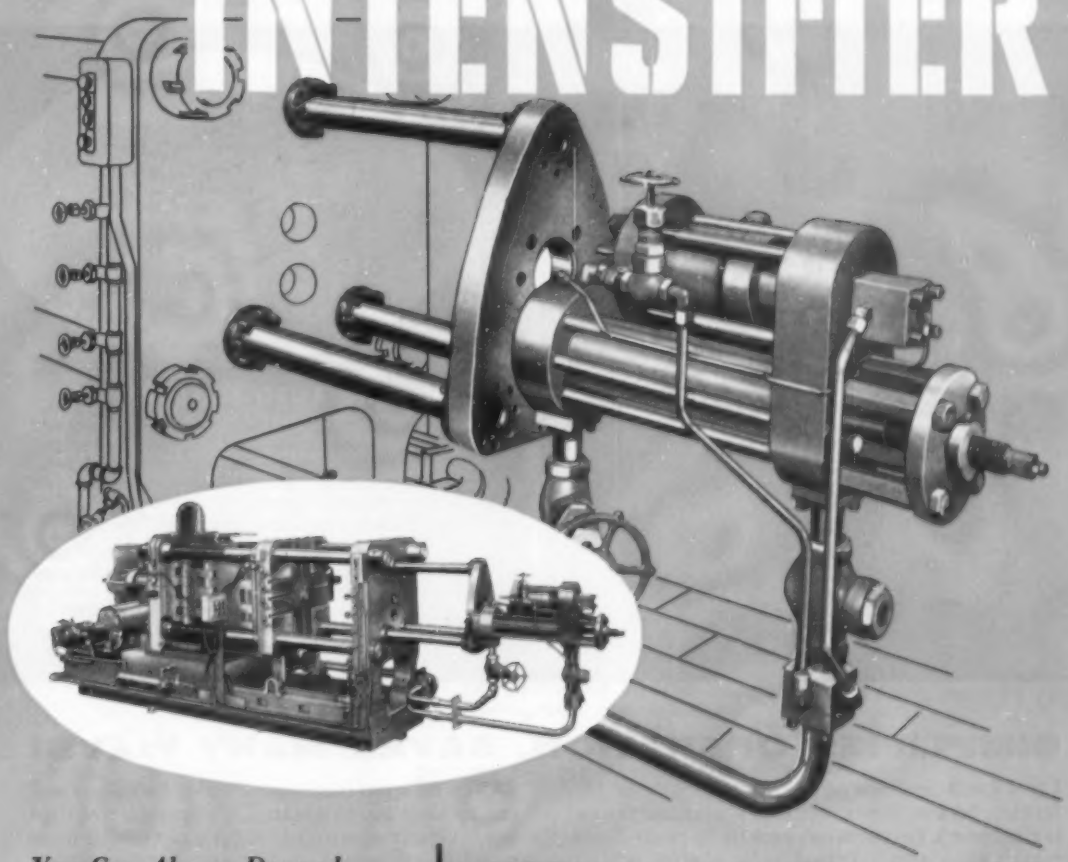

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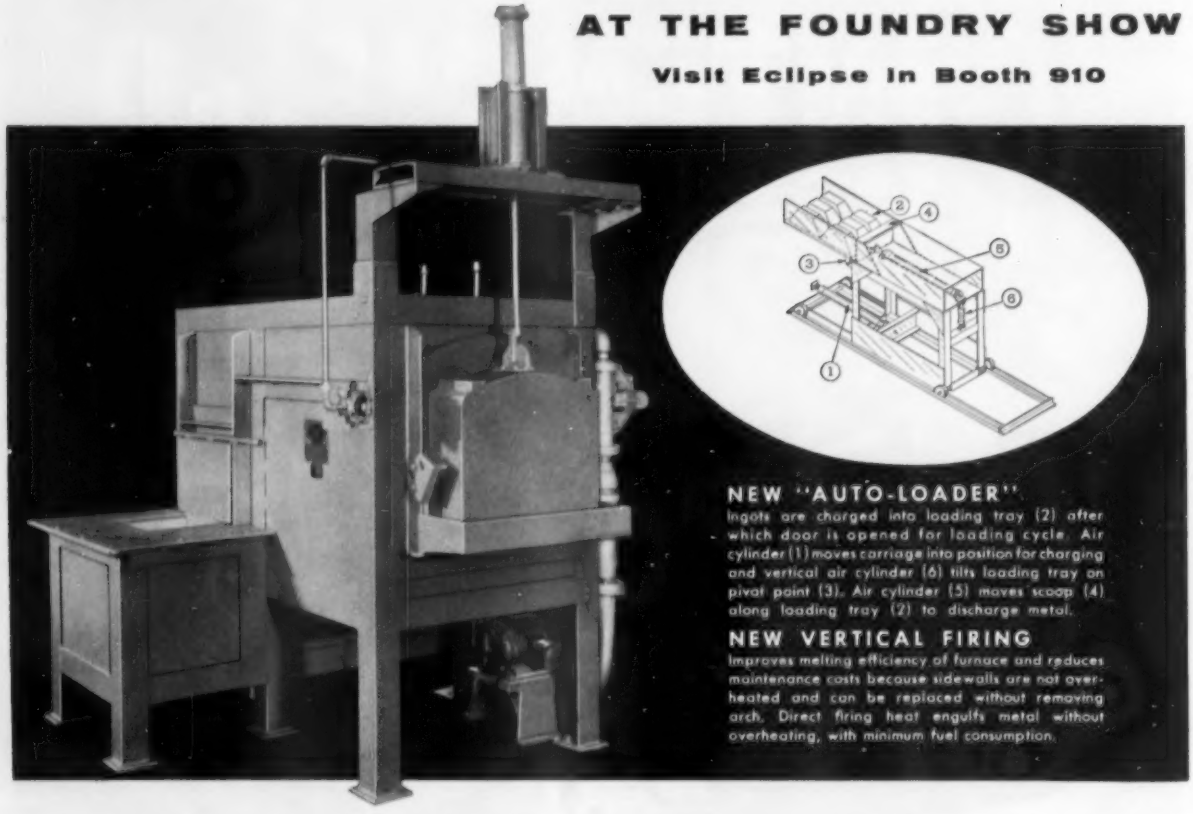

NEW "AUTO-LOADER"

Ingots are charged into loading tray (2) after which door is opened for loading cycle. Air cylinder (1) moves carriage into position for charging and vertical air cylinder (6) tilts loading tray on pivot point (3). Air cylinder (5) moves scoop (4) along loading tray (2) to discharge metal.

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Improves melting efficiency of furnace and reduces maintenance costs because sidewalls are not overheated and can be replaced without removing arch. Direct firing heat engulfs metal without overheating, with minimum fuel consumption.

SIMPLIFIES OPERATION, SAVES MANY WAYS!

SAVES wear and tear on furnace and operator. On furnace, because impact of metal against refractory is eliminated. On operator, because he easily loads metal onto the "Auto-Loader" after which charging is automatic and power actuated.

SAVES fuel costs because of the direct and efficient manner in which heat is applied to the metal, plus quality furnace features that permit high production with minimum fuel consumption. No heat transfer barrier exists as with pot or crucible . . . heat engulfs metal without overheating.

SAVES on scrap loss because oxide inclusions and gas pick-up are eliminated. Temperature of dip-out is closely controlled, so no scrap results from metal being poured at the wrong temperature.

SAVES maintenance because aluminum oxide will not build up on the non-wetting refractory. Only refractory which requires periodic replacement is that of the dry hearth. If melting temperatures are controlled for rated capacities, aluminum will not penetrate this refractory, extending service life greatly.

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COVER STORY

TESTING is an important phase of manufacturing these antenna rotors. J. P. Chadowski, Chief Engineer of The Radiart Corp. is shown here checking some of the die cast units. See article on 44.

APRIL, 1956 VOLUME 14 NUMBER 4

Precision Metal Molding

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Exceptional beauty of form and finish is provided by dense, sound, clean aluminum die-castings without surface imperfections—then buffed to a gleaming finish.

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REQUIREMENTS: Strength with minimum weight—accuracy of dimensions and fidelity of design—smooth, brilliant natural metal finish.

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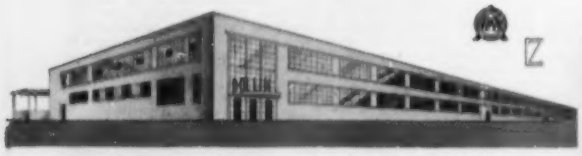

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BETWEEN THE LINES

WHERE WOULD YOU USE VACUUM PLATING? Anywhere that a baked lacquer coating is durable enough, according to the chief engineer of a company doing vacuum plating on die castings and other metal components. The elements of cost, appearance and durability, as well as a step-by-step report on the methods of applying vacuum plating, are contained in a special article beginning on page 51.

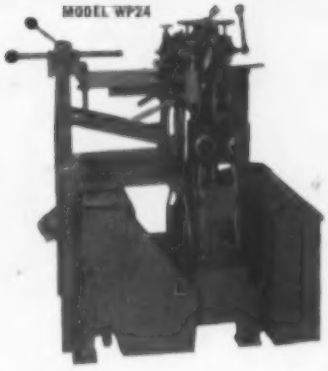
DESIGN POINTERS for powder metallurgy were so popular when PMM presented them in the December 1955 issue, that the supply of extra copies and tear sheets was very quickly exhausted, and we had to resort to photostats to meet the demand. We anticipate similar response to the feature showing design pointers to help in detailing die castings. This will start in this issue on page 36, and will continue in May.

WE'RE MOVING AGAIN. When we moved into our present quarters ten years ago, we wondered what we'd do with all the extra space. Now, with seven monthly magazines, two quarterlies and three directories, plus greatly expanded circulation, reader service and production departments, we're pushing the walls. So, on April 1, we move to the Caxton Building here in Cleveland, 812 Huron Rd. That ought to hold us . . . at least for a few years.

ANSWERS TO YOUR QUESTIONS ON POLISHING & BUFFING will be the objective of a special feature in the May issue of PMM. The round-up article, based on answers to a series of questions submitted to leading producers and users of polishing and buffing equipment, will cover recommended procedures for finishing die castings. It will include such factors as feeds, speeds, grits, buff diameters and type of compounds for finishing a variety of die cast shapes in all alloys. We think you'll want to keep it for reference in your finishing department.

MORE THAN 40 PAGES in this issue are devoted to the Fifth Annual Directory of the powder metallurgy industry. It is a project which has grown bigger each year, with new companies and new products to be included for this expanding industry. We have planned it to provide you with a complete guide to sources, whether you design, buy or produce powdered metal parts.

FOR BETTER WAX PATTERNS...



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INJECTION PRESS

Better wax patterns will be yours every time with this modern injection press. The operation is faster and easier too!

Press is designed for production of large as well as small wax patterns. Wax is extruded under accurately controlled pressure and temperature to assure uniformity of patterns.

Removable wax cylinder holds 138 cubic inches of wax — enough to make patterns for 39 pounds of steel castings. Total wax capacity including four cylinders in reserve tank, is 690 cubic inches.

Die holding table opposite horizontal nozzle is adjustable to height. Vertical nozzle is spring-loaded for automatic discharge. Special die closing devices will be supplied to meet your specifications.

Write for Descriptive Bulletin

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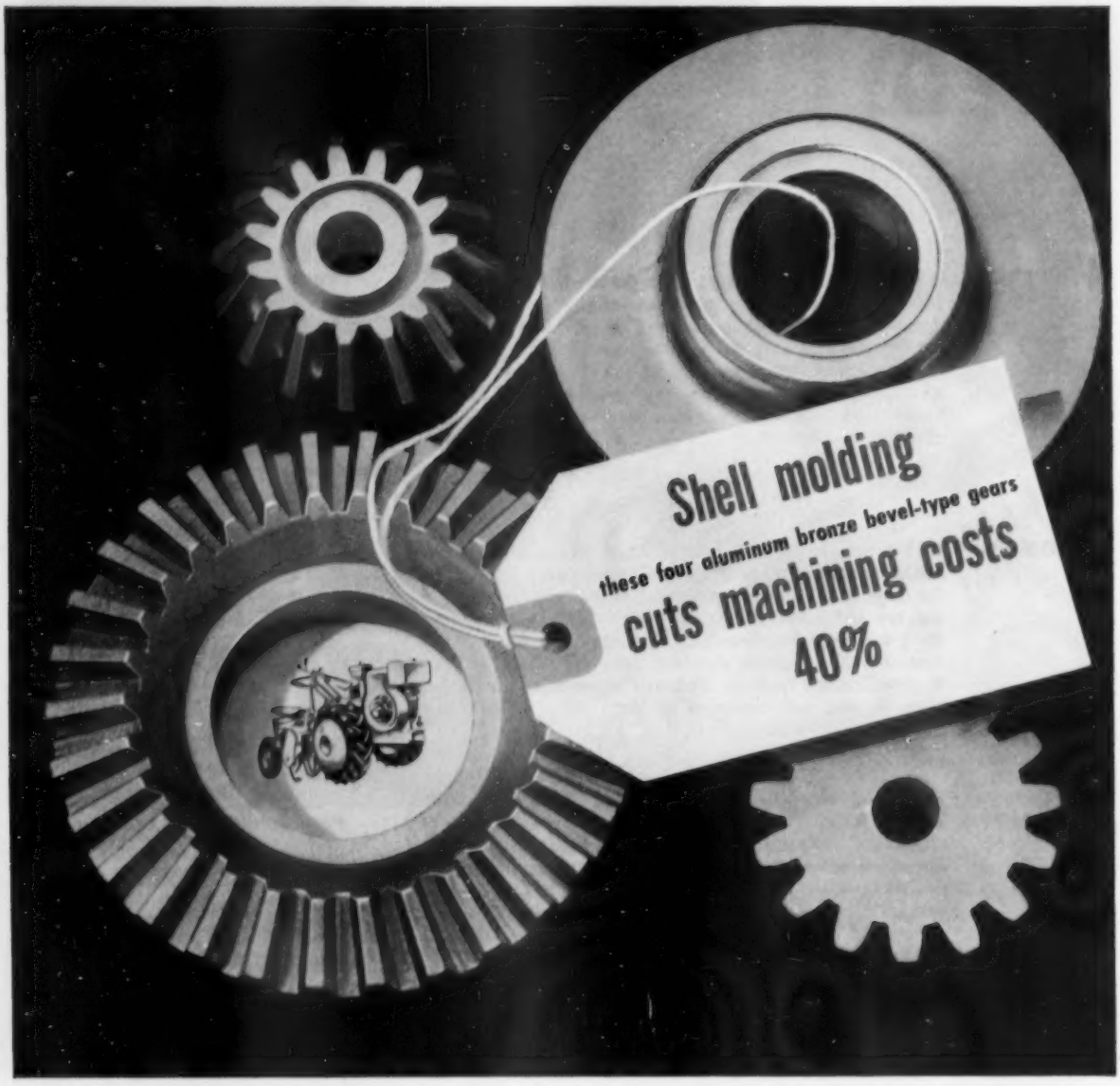

Manufacturer: **Midland** • *Shell Molder:* **King Industries** • *Product:* **Midland Tiller-Tractor**

Shell Molding Resin: **#47 Plenco**

These gears (illustrated actual size) are part of the differential assembly of the fine tiller-tractors made by The Midland Company, South Milwaukee, Wis.

In the former plaster casting method, the gears had to be set up in a turret lathe for boring and counter-boring the shaft holes. A recess had to be cut in the hub and the flat side of hub machined. In addition, the teeth around the ingate had to be shaped to size.

By using modern, shell molded castings made with Plenco #47 resin, King Industries, Milwaukee, was able to eliminate all these time and material consuming operations. The turret lathe was replaced by a drill press for one simple reaming operation—now the only finishing required on the shell-molded gears. *Result: a reduction of 40% of the previous machining costs.*

Other advantages of the shell-cast gears include better uniformity and tolerance control from lot to lot, so that inspection of incoming gears by the end-user has become a mere formality. Why don't you investigate the many economic and production advantages of shell molding with dependable, versatile Plenco resins?

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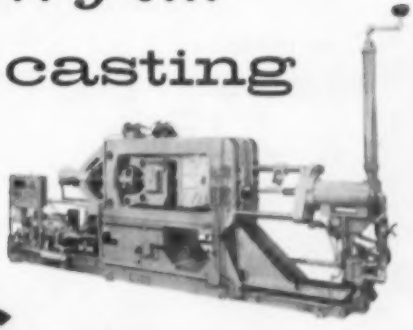
Now

It's Lewyt... die casting



on LESTERS...

"We're glad we got into die casting. We've effected tremendous savings in this brand new department with the five Lesters we have running. And they're doing a swell job. For instance, the HP-1-Z has been running almost continuously since the day it was installed 12 months ago.

"Yes, we are very happy with our Lesters...and our future expansion plans include more of them."

So says Sy Olanoff, plant manager of Lewyt Air Conditioner Corporation in Brooklyn, New York.

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CASTING ABOUT

HOW TO FILTER CORROSIVE SLURRIES developed in an atomic energy plant posed a serious problem until engineers hit upon using porous metal filters made of sheets produced by powder metallurgy. These sheets, composed of nickel, stainless steel, Monel or similar metals, appear to be solid sheets, but are actually composed of a porous structure, with 50 percent of the volume represented by uniformly-sized, interconnected pores. These filters, produced by Micro Metallic Corp., are valuable for filtering where ceramic or other type filters cannot withstand pressures, temperatures or corrosive conditions.

The porous metal sheets, usually ranging from 1/16 to 1/8 inch thick, can be welded (with nickel electrodes), sheared, bent or otherwise fabricated. They retain their strength and ductility at both very low and high temperatures. No bonding agent is used in making these sheets from powdered metals whose strength is achieved by sintering in an electric furnace. Depending upon the selected pore size, particles as small as ½ micron can be filtered out. Other uses for this material: filtering plastics and other viscous materials, filtering out powdered catalyst from petroleum cracking, laboratory filter crucibles, filtering liquid sodium or fluorine-containing gases.

THE MAJOR LIMITATION ON ROCKETS AND MISSILES, according to Robert A. Lubker, manager of metals research at Armour Research Foundation of Illinois Tech, is the need for improved alloys. One of the most serious requirements, he says, is for alloys having greater strength at elevated temperatures combined with low density.

THEY FLED TO THE UNITED STATES when the Nazis seized their plant in Germany in 1939. Now they are expanding into a new plant with the business which they set up in a Racine garage with $3,000 borrowed capital in 1941. Founded in 1882 in Duesseldorf, Germany, as Firma A. Schumann, the son and grandson of the founder, Robert Helmut Schumann did not give up when their German plant was taken from them, but established the company known as Precise Products Corp. in Racine. Ten years ago they were able to expand into larger quarters to manufacture their line of portable electric power quills, grinder-millers and other precision tools. Now, they have moved again into a plant they have just completed, giving them a 100% increase in production facilities. Footnote: Their original German facilities were returned to them after World War II by the AMG and are now operated as Precise G.M.B.H. in Duesseldorf.

RESEARCH IN SHELL MOLDING will be the main activity at a new facility established at Connellsville, Pa., by Shallway Corp. According to John B. Shallenberger, company president, the research center will be a "clearing house for the exchange of technical information relating to shell molding pattern and core box design."

FIELD REPRESENTATIVES are the newest service offered by the job shop die casters to industry. A new system of field representatives has been set up by the American Die Casting Institute, national

Continued on page 12

with an hour off for lunch!

This mountain of die castings is the eight-hour production of one man and a Cleveland Die Casting Machine, working in the shop of a leading West Coast diecaster. The shop reports this Cleveland machine puts out 30% more production than the equipment previously used . . . and their casting quality improved materially. The uniform, porosity-free "hardware finish" castings turned out by this Cleveland enabled the firm to meet their production schedules and also permitted them to accept new business they could not handle before.

You will produce better castings, faster, at less cost with Cleveland Die Casting Machines. Investigate their advantages for your production.

Remember, *Clevelands Cut Costs*

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New IBM Electric Typewriter *dressed up in Die Castings by* MT. VERNON

CASE HISTORIES FROM MT. VERNON FILES

"New from carriage to keyboard, and years ahead in results, performance, design," is how IBM describes its new electric typewriter. And as with any leader in manufacturing, "new in design" at IBM means best in manufacturing methods. That's why this electric marvel is housed in die castings. Note how only four strong, thin-walled, large aluminum sections are used to completely enclose the complex machinery in a handsome example of modern styling. Note particularly the accurately-fitting sections and keyboard, and gracefully-rounded contours, always a delight to the eye, but often a manufacturing headache.

Not so, however when you use Mt. Vernon die casting — the modern, high-speed, low cost production method that produces the most intricate parts, frequently so flawlessly perfect that only a final painting step is required before assembly. Best of all is the complete service available from Mt. Vernon's coordinated designing, die-making, casting, and machining facilities, all under one roof, which can supply die cast zinc and aluminum parts ready for use; reducing need for machining and finishing.

A switch to die casting or to a complete die casting service like ours, may be your next step. Let's discuss it.

MT. VERNON
DIE CASTING CORP.
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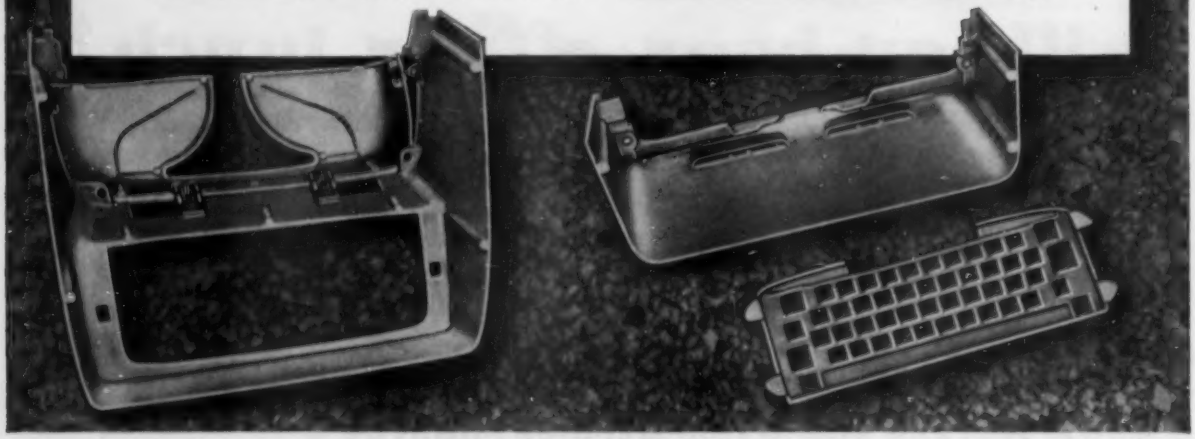

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USCO K-Z

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USCO K-Z, like all other USCO Aluminum Alloys, is production and quantometric controlled from raw materials to finished ingot under the most modern methods of alloying and refining—giving you the properties you desire in your castings.

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Let our metallurgical engineers, who have a practical working knowledge of die-casting, aid you in selecting the correct alloy and assist you with your melting and casting problems.

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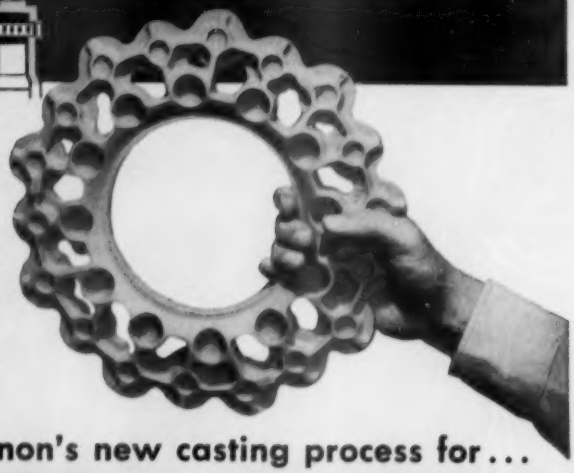
CERAMICAST*



Typical of the intricate design and thin metal sections possible with the CERAMICAST process is this backing plate for a jet aircraft brake.

Lebanon's new casting process for . . .

CLOSE TOLERANCE STEEL CASTINGS AT LOW COST

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- **TOLERANCES as close as** ±.003″ to .005″ per inch.
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- **THIN SECTIONS:** Metal sections to 3/32 of an inch. Knife-like edges to .030″ or less.
- **SMOOTH SURFACES:** Variations held to 125 micro-inches or better.

FOR PRICE

- **LOWER PRODUCTION COSTS:** Jobbing wood or metal patterns can be used. Design changes quick and inexpensive.
- **REDUCED MACHINING COSTS:** Smooth, accurate castings greatly reduce or eliminate machining.
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CARBON, LOW ALLOY AND STAINLESS STEEL CASTINGS

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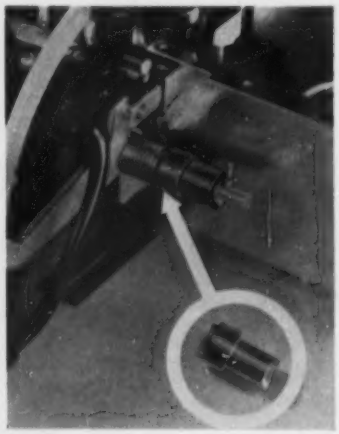
CASTING ABOUT
continued from page 8

association of job shop die casters whose members produce more than 80% of all die castings made for sale in the United States.

As announced by David Laine, secretary of ADCI, the new field representatives are: Eastern Region —G. M. Rollason, recently retired head of Alcoa's Die Casting Division and a past president of ADCI; Central Region—J. C. Fox, formerly chief metallurgist of Doehler-Jarvis Div. of National Lead Co.; and in the Pacific Coast Region—J. M. Davis, formerly president and general manager of Union Die Casting Ltd.

This group of expert die casters will implement the already-active program of the ADCI to provide technical improvements to the industry through such units as the Die Casting Research Foundation, the Certified Zinc Alloy Plan and the ADCI Product Standards program.

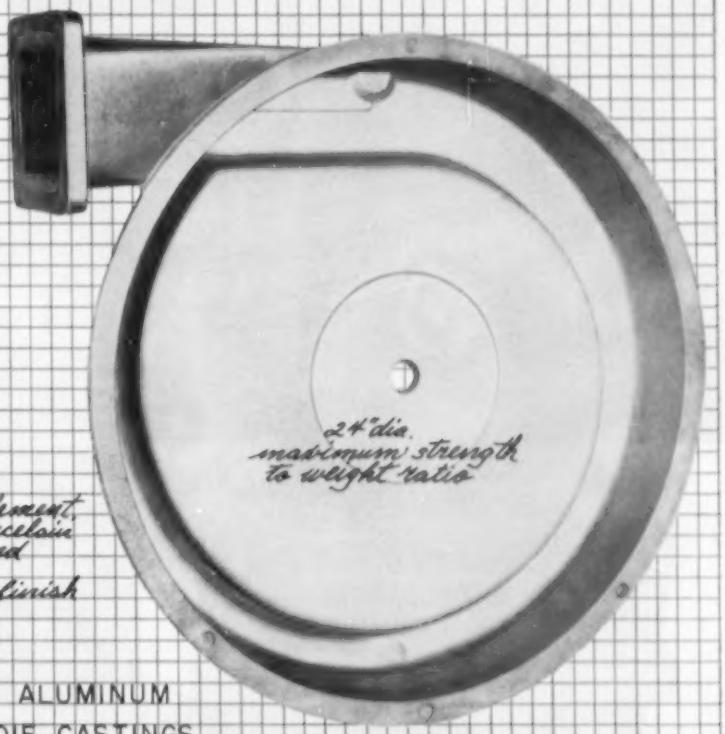
SAVINGS OF 80 PERCENT were realized by producing this part from powdered iron, instead of by machining it from bar stock. It is an



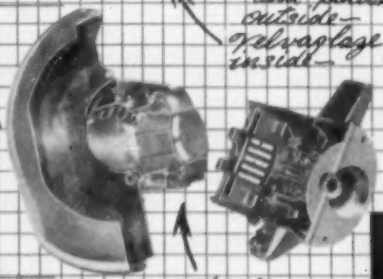
overtravel safety bushing for Revere Camera Company's new automatic slide projector, produced from reduced iron powder by Chicago Powdered Metal Products Co. The powder is from Plastic Metals Div., National-U.S. Radiator Corp. Porous structure of the part permits impregnating with molybdenum sulphide type lubricant for lifetime service. The bushing's offset flanged shape with a shoulder at one end and lugs on the other, plus a shaft hole, made machining operations costly on the steel part.

Continued on page 15

ALUMINUM
PERMANENT MOLD



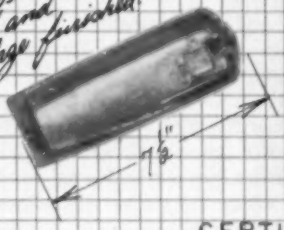
Cast-in element colored porcelain and polished outside—Velvaglaze finish inside—

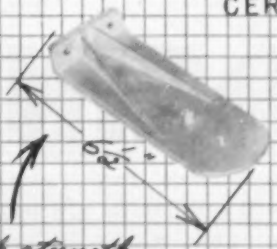


ALUMINUM
DIE CASTINGS

2 units of multiple assembly Durable inexpensive Velvaglaze castings

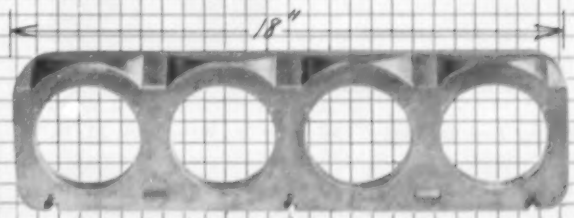
Intricate housing cast in 2 parts. Fully machined and Velvaglaze finished





high strength—
dimensional accuracy

CERTIFIED ZINC CASTINGS



accurately cast and machined for reduced assembly cost—

How can you get

MORE CASTING VALUE PER DOLLAR

Monarch pioneers in casting progress. Exclusive developments such as continuous-melt furnaces, porcelain enamel on castings, and Velvaglaze®, are your means for improving product performance and lowering end-cost.

Monarch Aluminum permanent mold and aluminum and zinc die castings are custom engineered to meet your total requirements. Send for new brochure, "Monarch Pioneers in Casting Progress".

MONARCH ALUMINUM
PIONEERS IN CASTING PROGRESS

MONARCH ALUMINUM MFG. COMPANY
9205 Detroit Avenue, Cleveland 2, Ohio

® Reg. T. M.

For more information circle No. 70 on the Reader Service Card

NUMBER 1 OF A SERIES

PRODUCTION SHORT CUTS WITH

ZINC DIE CASTINGS

The RAMBLER puts on its best front!

The completely new 1956 Rambler—by American Motors—features a unique front end assembly styled to endow this compact, economical car with a massive, forward-thrusting look. And this assembly graphically illustrates why ZINC Die Castings are so widely specified by design engineers in and out of the automotive industry.

As you see, the ZINC Die Cast grille is attached to a sheet metal frame before mounting on the car. The grille top molding and the inboard headlamp bezels are then attached to cover the frame and complete the front end. Because such unusual shapes can be die cast, only four castings are required in the assembly (plus the two running-light bezels in the fenders).

Send for your copy

The Rambler front end assembly is further simplified by casting the steel mounting bolts as inserts in the back of both the grille and the molding. These precisely located fastening elements, plus the overall dimensional accuracy of the castings, assure perfect fits every time. Add easy finishability (all of the castings are beautifully chromium plated) and you have the principal reasons why ZINC Die Castings are specified by American Motors engineers.

For possible answers to *your* particular production problems, send for our brochure and contact any commercial die casting company.

ZINC
FOR DIE CASTING ALLOYS

The New Jersey Zinc Company, 160 Front St., New York 38, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on

HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

For more information circle No. 78 on the Reader Service Card

CASTING ABOUT
continued from page 12

NEW TURBINE BUCKET ALLOY is being produced by Utica Drop Forge & Tool Corp. It is called Udimet 500, a nickel-chromium-cobalt alloy with 3% each of titanium and aluminum. Its reported properties: tensile strength of 100,000 psi at 1600 F, and ability to withstand constant stress at 28,000 psi for more than 100 hours. It is being melted at the rate of 60,000 pounds per month in Utica's 1000-lb vacuum furnaces.

CENTENNIAL OF A SCIENTIST responsible for such developments as the production of silicon carbide in his electric furnace, man-made graphite and colloidal graphite was marked on March 9. Edward Goodrich Acheson, born in 1856, was granted 70 patents for his work in chemical and electrical fields. He was the founder of The Carborundum Co., Acheson Graphite Co. (now part of the National Carbon Div. of Union Carbide and Carbon Corp.), Acheson Colloids Co., and Acheson Colloids Ltd. (England).

SCIENCE SCOUTS is a new idea originated by a West Coast industrialist to help stimulate greater interest among youngsters in choosing engineering as a career. A group of engineers, led by Roy E. Marquardt, president of Marquardt Aircraft Co., has inaugurated an experimental unit of "Science Scouts" which may become an official part of the Boy Scouts of America.

Local executives of the Boy Scouts in the San Fernando Valley area are enthusiastic about the prospect of "Science Scouts" becoming an integral part of the Scouts organization, similar to Explorer Scouts. This would appeal to boys in the upper age group, and could possibly have a long-range favorable effect on our supply of engineers and scientists.

The idea for Science Scouts was generated originally by talks among three Marquardt men: Chief Powerplant Engineer John Winter, Chief Technical Engineer Joseph Friedman, and Public Relations Director Jack Anderson.

Possible projects: designing and launching a hypothetical spaceship, exploring the use of solar and nuclear energy to replace dwindling coal and oil reserves, examining the social implications of scientific progress.

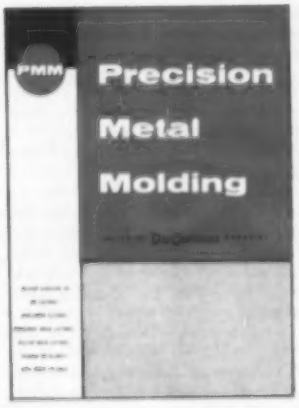
Announcing

A VALUABLE NEW GUIDE FOR DESIGNERS AND BUYERS

a single source book and buyers guide of investment casting

Investment Casting Directory

will be published in the June, 1956 issue of



Get complete facts from PMM

812 HURON RD.
CLEVELAND 15, OHIO

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

DATA OFFERED IN THIS MONTH'S ADS

2. IMPROVED DIE LUBRICATION for die casting production with 'dag' colloidal graphite dispersions is the subject of catalog 425 from Acheson Colloids.

4. PREALLOYED STAINLESS STEEL powder to meet standard AISI specs are available from Alloy Metal Powders, Inc., and are fully detailed in literature available from the company.

6. COOLING HYDRAULIC OIL on die casting machines with Ross Type BCF heat exchangers is described in bulletin 1.1K5 from Ross Heat Exchanger Div. of American-Standard.

8. PROPERTIES & CHARACTERISTICS of carbonyl iron powder, along with data on applications, are contained in a 32-page book offered by Antara Chemicals.

10. HYDRAULIC HOSE for use with all types of fire resistant hydraulic fluids is introduced in bulletin 157 from Aeroquip Corp.

11. MELTING FLUXES for use with zinc in the die casting industry are the subject of a technical bulletin from Atlantic Chemicals.

12. PLUNGER RINGS for die casting machines, with exceptionally long life, are described and illustrated in literature from Auto-Diesel Piston Ring Co.

14. VERY FAST CASTING cycle, reported to be up to 1100 shots per hour, is a feature of the die casting machine described in literature from American Die Casting Machinery.

15. DIE CASTING MACHINES in a full range of sizes and capacities are included in a catalog available from B & T Machinery Co.

17. POWDERED METAL PRESS featuring 4-column, crank-type construction, is the subject of a new bulletin from Baldwin-Lima-Hamilton.

19. TENSILE STRENGTH of 80,000 psi min and apparent density of 6.2 g/cc are attributes of powdered metal parts produced by Burgess-Norton's new Quali-Sint process, described in new literature.

21. MELTING STOCK CUSTOM-MADE for investment casting, available in quantities for large or small melting batches, is the subject of technical literature from Cannon-Muskegon.

23. FIRE RESISTANT FLUIDS for use in hydraulic systems of die casting machines are covered in literature on Cellulubes from Celanese Corp.

25. FROM 2 OZ. TO 65 LBS. is the range of permanent mold castings produced by Centr-O-Cast and Engineering Co., and described in a new, illustrated brochure.

26. STANDARD OILITE BRONZE bushings in 1085 sizes are listed in the new Bearing Stock List S-56 from Amplex Div. of Chrysler Corp. It also includes complete list of Oilite bronze cored bar and plate material from stock.

34. ADVANCED POWDER METALLURGY is the title of a booklet offered by Dixon Sintaloy to introduce their unusual plant facilities for producing powdered metal parts.

35. ATOMIZED IRON POWDER available for powder metallurgy, as well as flame cutting, scarfing, electronics and other uses, is the subject of a technical booklet from Easton Metal Powders.

38. SPECIAL LUBRICANTS for die casting and forging are the subject of technical data sheets offered by Fiske Brothers Refining Co.

39. SHELL MOLDING MANUAL offered by General Electric Company contains 28 pages of information on techniques and benefits of this process.

41. SMALL ZINC DIE CASTINGS is the title of a booklet offered by Gries Reproducer Corp., covering the specialized facilities.

42. DESIGN DATA concerning Supermet high density iron powder components, can be obtained. The company's specialty is high density powdered metal parts made from pure electrolytic powder.

44. CONTROLLING WATER FLOW with a new type of flow switch with safety interlock is included in a series of six technical folders, including diagrams, from Hays Mfg. Co.

45. BIBLIOGRAPHY OF POWDER METALLURGY has been prepared by Harper Electric Furnace Co., indexing 250 authoritative articles under 14 subject headings.

46. ENGINEERING DATA, technical information and recommended uses are included in a new booklet on zinc base alloys for die casting, prepared by Henning Bros. & Smith.

47. POWDER METALLURGY DATA is available from Hoeganaes Sponge Iron Corp., who offer a literature-package of up-to-date information.

49. FIRE RESISTANT HYDRAULIC fluids are the subject of informative literature discussing Houghto-Safe, offered by E. F. Houghton & Co.

50. HEAVIER, MORE RIGID die casting machines are featured by Hydraulic Press Mfg. Co. in their new complete catalog showing a full range of models and capacities.

53. INVESTMENT CASTING BROCHURE is offered by Investment Casting Co., presenting photos and descriptive matter on their facilities and some of the castings they have produced.

57. OPERATIONAL DATA and furnace ratings are included in the new book prepared by Detroit Electric Furnace Div., discussing their line of rocking electric furnaces for use in investment casting.

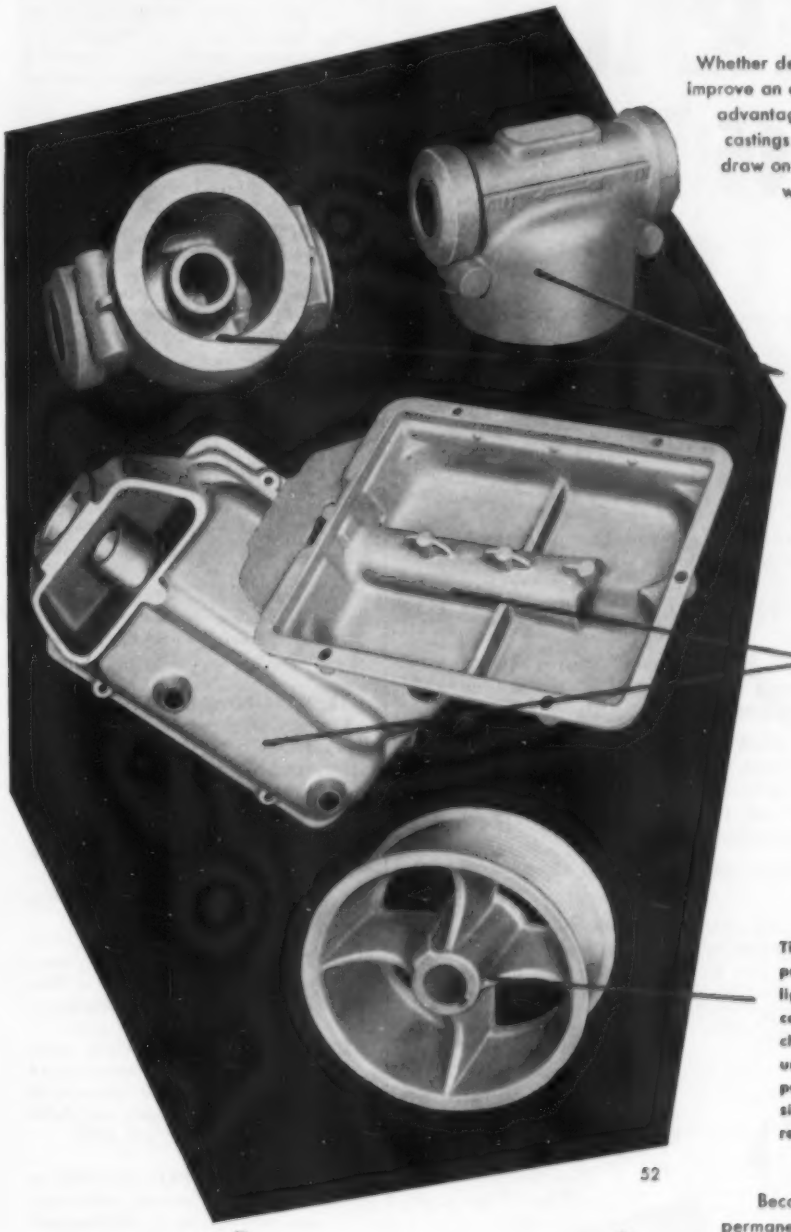
58. BIG FAMILY OF PRESSES for powder metallurgy is offered by Kux Machine Co. in a catalog covering both mechanical and hydraulic presses in large, medium and small capacities.

59. DIE CASTING MACHINES with a self-compensating locking clamp are fully described and illustrated in Lake Erie Engineering's new bulletin 255.

Continued on page 18

improving product characteristics by converting to precision

centr-O-cast aluminum castings



Whether designing a new product or looking for ways to improve an established one, you should consider the many advantages to be obtained with high quality aluminum castings from Centr-O-Cast. At Centr-O-Cast, you can draw on the vast knowledge of our engineers for help with your design, and on the experience of our molding section to produce the finest parts from that design.

Part of the high-pressure hydraulic system in an aircraft, this casting must be of minimum weight yet possess the strength to withstand 3750 lbs. bursting pressure. No porosity or inclusions are therefore allowable, and uniform quality is essential. In its heat-treated condition as supplied by Centr-O-Cast, this aluminum alloy casting machines as smoothly and accurately as the finest of free-cutting steels. Thus accurate tolerances in chambers and thread diameters are easily maintained.

Originally produced in cast iron, this burner housing is now cast of aluminum in a cored permanent mold by Centr-O-Cast. The decrease in weight has lessened shipping costs, and made the finished unit easier to suspend in use. The cast-in holes and the accuracy of the permanent mold eliminate the need for machining on the flat surfaces and reduce the amount needed on the cored holes and formed flange. The smoother internal surfaces result in better gas flow and the natural aluminum gives desired reflection.

This overhead door pulley is cast from aluminum in permanent molds. In addition to the high strength and light weight inherent in aluminum, the accuracy of the casting results in a center hole so precise that machining is not needed. And the spiral grooves are so uniform in diameter and correctly spaced that the pulley winds evenly, without danger of raising one side of the door before the other. The aluminum part requires no paint, and resists weathering.

52

centr-O-cast

CENTR-O-CAST AND ENGINEERING COMPANY

45 St. Jean Avenue, Detroit, Michigan

Because we work with many molding techniques—permanent mold, semi-permanent, centrifugal or centrifuge—our engineers are not limited in their recommendations and can better assist you in choosing the right casting method for your product. We work in all the aluminum alloys, have heat-treating facilities, and are equipped to produce castings ranging from 2 ounces to 65 pounds.

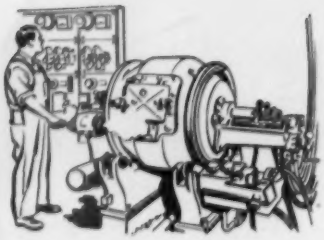
Write for our illustrated brochure or a personal call by our casting consultant.

For more information circle No. 25 on the Reader Service Card

DETROIT ELECTRIC FURNACE ANNOUNCES

LIBERAL LEASING PLAN

Get production savings from Detroit ROCKING Electric Furnaces without heavy capital investment



A liberal leasing plan is now being offered by Detroit Electric Furnace to allow more foundries to enjoy the production economies of these exceptional indirect arc electric furnaces. Now manufacturers can have modern, efficient metal melting equipment without large outlays of working capital.

Under the DEF leasing plan, you'll find that manufacturing savings from reduced melt losses, less scrap, and savings in labor and time will more than pay for the furnace lease.

The original lease term of three years requires a reasonable deposit and a low monthly rental computed on the commercial purchase price of the equipment. Lease may be renewed for two more three-year terms at considerably reduced rentals. Minimum value of equipment which will be leased is $5,000.

A lease renewal or a purchase option may be exercised at any time after the initial three-year term.

This leasing plan is available on all Detroit Rocking Electric Furnaces and equipment. Take advantage of this opportunity to have these famous furnaces working for you without large capital investment. A letter to Department L, Detroit Electric Furnace Division, will bring you complete information.

WRITE FOR FREE BOOK

"High Production with Consistent Quality," shows and describes how you can get fast, modern, efficient melting. Includes ratings and operational data on all Detroit furnaces. Write today for Bulletin 559.

DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company, Bay City, Mich.

Foreign Representatives: In BRAZIL—Equipamentos Industrias "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Casco, S. de R. L. Atenas 32, Despacho 14, Mexico City, D. F.

For more information circle No. 57 on the Reader Service Card

DATA IN ADS
continued from page 16

60. DIE CASTING MACHINES manufactured by Lester-Phoenix are brought together into a catalog showing the full range of sizes and types.

61. SINTERING FURNACES for powder metallurgy are the subject of a bulletin from Lindberg Engineering.

62. DESIGN DATA to help in planning your aluminum or magnesium die castings is available in booklet form from Litemetal Dicast, Inc.

64. RESISTANCE MELTING of aluminum, magnesium, zinc and lead for permanent mold or sand casting is the subject of Bulletin 320 from Lindberg-Fisher Melting Furnaces.

70. PIONEERS IN CASTING, Monarch Aluminum Mfg. Co. offers a new brochure describing their accomplishments, and their facilities for die and permanent mold casting.

74. STANDARD BEARINGS FROM STOCK are listed in a new brochure from National Molded Products, Inc.

75. IRON POWDER, already blended with graphite and stearate ready for use in powder metallurgy, is offered by Plastic Metals Div. of National-U.S. Radiator. Specs are offered in new data sheets.

76. HOW & WHEN TO HOB is the title of a booklet published by Newark Die Hobbing and Casting Co.

78. ZINC DIE CASTINGS are given a comprehensive discussion in New Jersey Zinc Company's booklet.

80. NON-FERROUS POWDER parts are the subject of a brochure issued by New Jersey Zinc Co., showing 24 case histories of brass and nickel silver powder structural parts.

82. DATA ON STEARATES, used as lubricants in powder metallurgy, are offered by M. W. Parson-Plymouth, along with free samples.

84. DIE CASTING SERVICE offered by Precision Castings Co. through its nationally integrated organization, is explained in literature from the company.

Continued on page 20

How SHELL MOLDING with G-E shell resins

CUTS COSTS

for CRUCIBLE STEEL COMPANY OF AMERICA

Ask Crucible Steel about shell molding with General Electric shell resins and you'll get a glowing report on *better castings at lower cost!* For Crucible finds the shell process ideal for casting parts in its new Rexalloy*—a super-hard alloy that's too tough to machine easily, too expensive to waste through machining allowances. Shell-molded Rexalloy parts are often usable as cast—far smoother and sharper than conventional sand castings—much less expensive than investment castings. To obtain these benefits, Crucible uses G-E shell resins, relying on them for batch-after-batch uniformity and properly balanced properties.

*Reg. trademark, Crucible Steel Company of America.

How can shell molding help YOU?

General Electric offers a number of products to help foundrymen get maximum benefits from the shell process: *G-E phenolic shell-molding resins* to form light, dimensionally accurate molds . . . *G-E silicone release agents* to free molds easily from patterns . . . *G-E phenolic bonding resin* to cement shell halves together.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Ask G. E. about shell molding!

General Electric maintains a shell-molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

FREE SHELL-MOLDING MANUAL!

General Electric Company
Section 6F3C1
Chemical and Metallurgical Division
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual.*
( ) We are presently using the shell-molding process.
( ) We are interested in the shell-molding process.

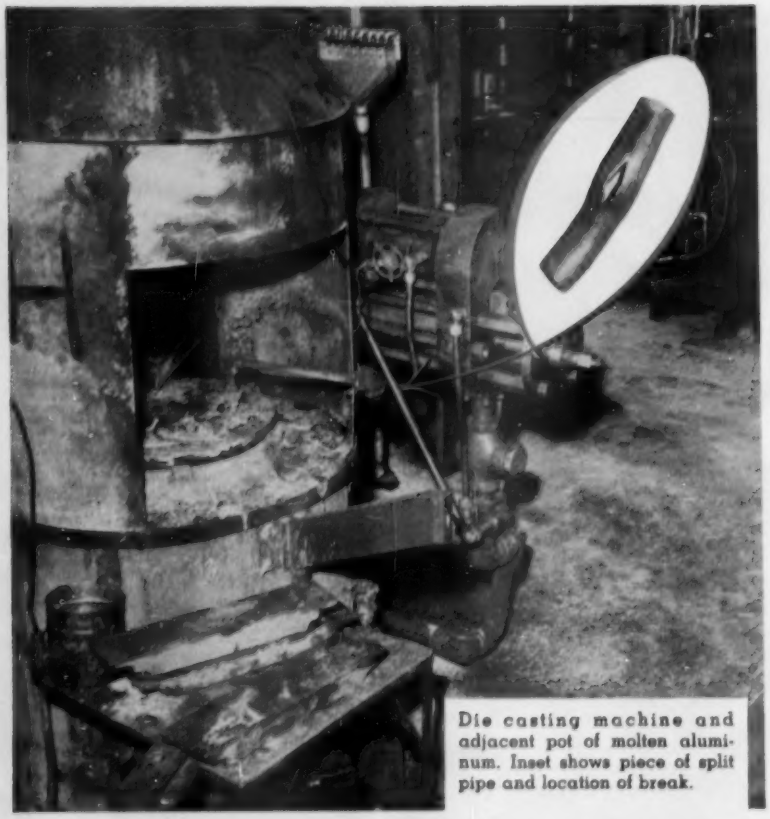
Name _____

Firm _____

Street _____

City _____ Zone ____ State ____

For more information circle No. 39 on the Reader Service Card



Die casting machine and adjacent pot of molten aluminum. Inset shows piece of split pipe and location of break.

HOUGHTO-SAFE SAVED EVERYTHING when this hydraulic line burst!

This plant is grateful that they had the foresight to install Houghto-Safe—Houghton's fire-resistant hydraulic fluid.

When this ¾" line gave way between the machine and melting pot, the fluid showered the machine, the molten aluminum, and the operator—BUT THAT'S ALL IT DID! There was no fire, no explosion, no injury.

Don't take chances with flammable hydraulic fluids in hydraulic lines near high heat or open flame. Install Houghto-Safe . . . the water base hydraulic fluid that won't burn. Houghto-Safe won't attack packings, is non-toxic and provides better-than-ever protection against pump wear.

Decide to take steps to safeguard your plant and personnel now. Call your Houghton Man or write for complete information on Houghto-Safe to E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33, Pa.

HOUGHTO-SAFE . . product of . . .

E F HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

For more information circle No. 49 on the Reader Service Card

DATA IN ADS

continued from page 18

86. HYDROGEN REDUCED IRON powders produced by Pyron Corp. are covered in technical data sheets now offered.

88. POWDERED METAL PARTS in a range of metals are shown in a new brochure from Reese Metal Products, showing their facilities for powder metallurgy.

89. IRON POWDER produced by Republic Steel Corp., is the subject of technical literature offered by the company.

91. WAX INJECTOR for making patterns for investment casting is described and illustrated in a brochure offered by Alexander Saunders.

93. HOW TO MACHINE ALUMINUM is told in a booklet issued by Geo. Sall Metals Co.

96. TITANIUM POWDER is the subject of a booklet available from United International Research, covering properties and uses.

99. PRE-ALLOYED STEEL POWDERS manufactured by Vanadium-Alloys Steel Co. have been written up fully in the technical literature offered by the company.

101. LOW COST CORROSION PROTECTION with Iridite, a surface treatment for all die cast metals, is discussed in literature offered by Allied Research Products.

102. SUBSTITUTION OF ALUMINUM for copper in electrical manufacturing is made possible by a chemical treatment explained in literature from Conversion Chemical Corp.

104. BARREL FINISHING equipment, supplies and abrasives are all listed in the complete catalog from Esbec Barrel Finishing Corp.

105. CONVERT YOUR DRILL PRESS to an automatic with a drill feed that is described, illustrated and priced in literature offered by General-Pacific Corp.

106. ABRASIVE BELT MACHINES are catalogued by Hammond Machinery Builders, including 11 combinations for grinding, polishing and deburring.

108. PERFECT THREADS WITHOUT TAPPING are possible using PIP push inserts for use in die cast alloys and other soft metals or plastics, as described in literature from Heli-Coil Corp.

Continued on page 61

DIE CASTING Zn

THIS HIGH-SPEED, LOW-COST PRODUCTION PROCESS enables industry to manufacture innumerable products which – produced by any other means – would be prohibitive in cost. As a result, today's American homes, offices and factories contain a host of labor-saving devices and conveniences which would not be there but for die casting – the only process that can mass produce direct from the raw material, precise, complex-shaped, close tolerance units economically.

Of the commonly used die casting alloys, those based on zinc offer the greatest number of desirable mechanical properties and casting characteristics at low cost. Hence, zinc has always been the preferred base metal of die casters.

If rising material and labor costs have you concerned, take a hard look at any part currently on your production line on which multiple machining operations are now required. As it has for many manufacturers, conversion to die casting may substantially cut your production costs too.

Highly skilled die casters, with complete quality control facilities to safeguard your savings, are within your reach.

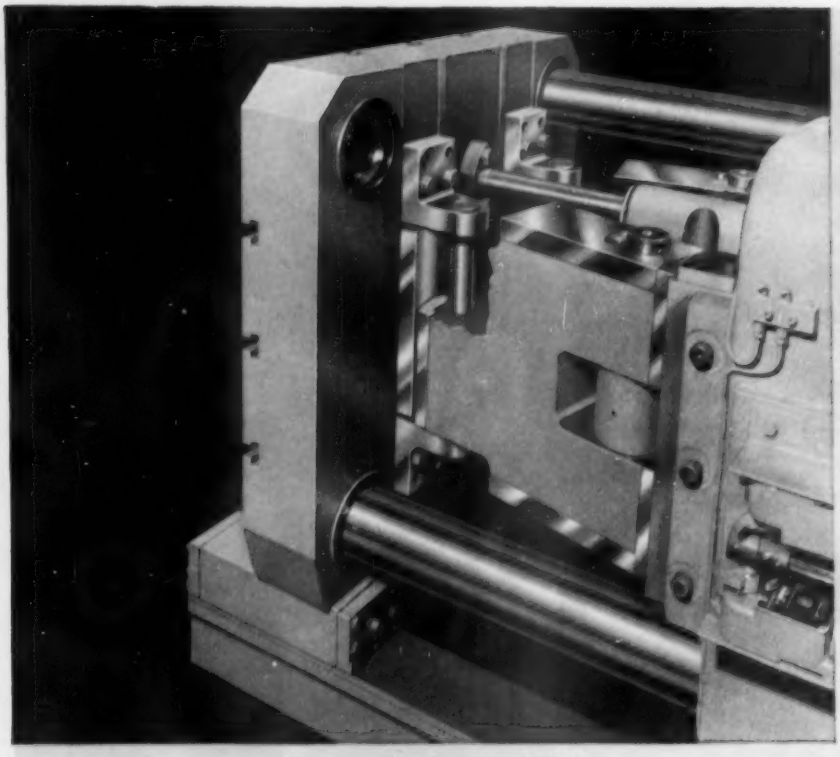
***DIE CASTING** is the Process*

***ZINC** the Metal*

***BUNKER HILL** the Preferred Zinc*

BUNKER HILL 99.99+% ZINC

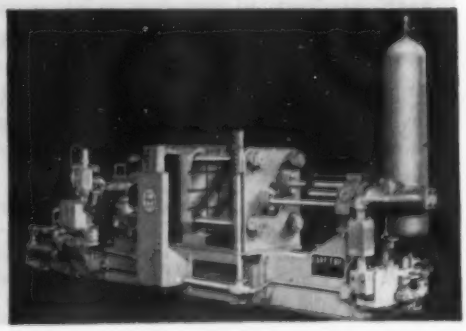
EASTERN SALES AGENTS **ST. JOSEPH LEAD COMPANY** 250 PARK AVENUE, NEW YORK 17
SALES OFFICE FOR PACIFIC COAST **NORTHWEST LEAD COMPANY** SEATTLE, WASHINGTON



15% to 25% MORE DIE CASTINGS PER DAY

with new knuckled Wedge Cam Toggle

- Time saved on adjustments and die set up with Wedge Cam Toggle gives you from 15% to 25% more time in actual production. The Wedge Cam Toggle is an accurate, self-compensating clamp. It automatically takes up clearances in the dies caused by contraction and expansion of the molds during production or shut-down periods. Wedge Cam Toggle also makes it possible to set dies in a single cycle in many instances. All models of the new Series D "expandable" die casters incorporate the new knuckled joint to eliminate shear stress on the pins.



LAKE ERIE DIE CASTING MACHINES

LAKE ERIE ENGINEERING CORPORATION

520 Woodward Avenue, Buffalo 17, N.Y.

LAKE ERIE ®

SEND FOR NEW BULLETIN 255

(Ask about 16mm. film)

Patented Wedge Cam Toggle and "Pressure-Pac" fully described.

TYPICAL DIE CASTERS *who use Lake Erie Machines*

ALLIS-CHALMERS MFG. CO.
FORD MOTOR CO.
JOHNSON MOTORS
KIEKHAEFER CORP.
DAVIDSON MFG. CO.
THE DOW CHEMICAL CO.
LUDMAN CORP.
GENERAL ELECTRIC CO.
GENERAL CONTROLS CO.
HOOVER CO.
GENERAL MOTORS — TERNSTEDT DIV.
HUNTER FAN & VENTILATING CO.
BOHN ALUMINUM & BRASS CORP.
CENTRAL DIE CASTING & MFG. CO., INC.
THE ELECTRIC AUTO-LITE CO.
MCCULLOCH MOTORS CORP.
MACKLANBURG-DUNCAN CO.
RUPERT DIECASTING CO.
SUPERIOR DIE CASTING CO.
WESTINGHOUSE ELECTRIC CORP.

For more information circle No. 59 on the Reader Service Card

LETTERS TO THE EDITOR

INTEREST IN COLOR ANODIZING

We have noted the letter in your "Letters To The Editor" column in the January 1956 issue of Precision Metal Molding with regard to color anodizing of aluminum. We were quite interested in the statement from the British commercial die caster that he is regularly producing die cast aluminum capable of being silver or color anodized.

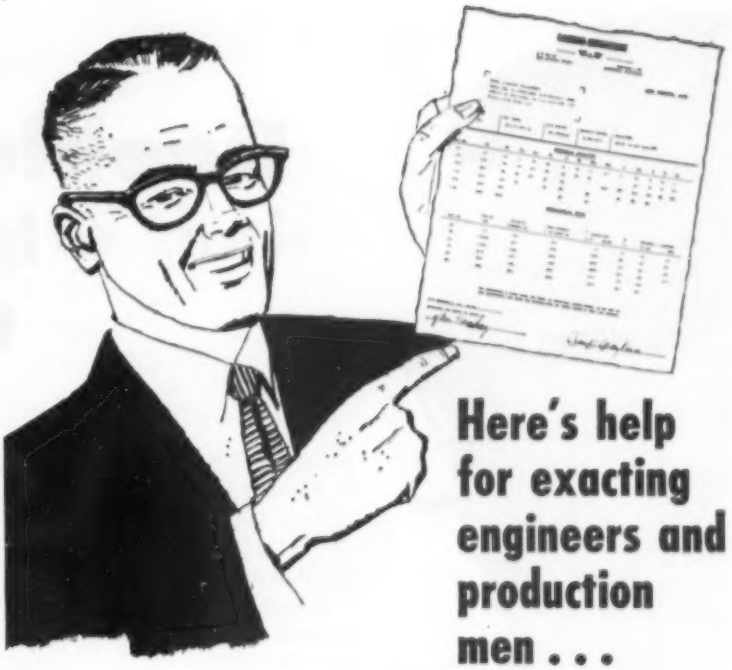
We would like to contact the author of this letter with reference to specific applications of the process and would appreciate it if you could give us his address.—B. L. M. (Research Metallurgist)

Two months after the original letter appeared in this column, inquiries are continuing to roll in, and are being referred directly to the British die caster who told us about his work color anodizing aluminum die castings. We have been promised an article by him on the subject.

Meanwhile, a commercial die caster located in the New England States has sent us four samples of aluminum die castings that he is producing and which are clear anodized. The anodizing is being done by a job commercial plating plant in New England. Writes the die caster: "We feel any qualified anodizing plant can achieve good results in coloring aluminum die castings." He, too, has promised PMM a full report on producing, designing and finishing by color anodizing... everything that is, **except alloy composition.**

Published here is a photo of four clear anodized aluminum die castings produced by the New England die caster.—Ed.

Continued on page 26



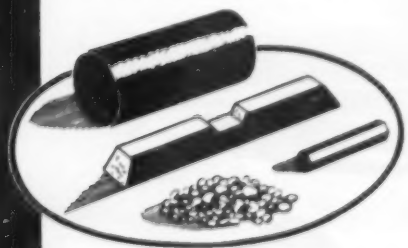
Here's help for exacting engineers and production men . . .

who must be absolutely right about metal analysis

WITH each MasterMet alloy you buy, Cannon-Muskegon gives you a certified, notarized analysis . . . black-on-white proof that MasterMet alloys are produced exactly to your specifications. This assures close predictable control of physical and chemical characteristics for any end-use. You can be confident that the results you plan — the performance you call for will be delivered in parts made with MasterMet alloys.

You can choose from a wide range of high alloys including cobalt-base and nickel-base alloys, chromium and chromium nickel stainless steels. Also included are such special alloys as Monel*, Inconel*, Invar, Ni-Resist*. Order these types or your custom specifications from Cannon-Muskegon.

*Trademark — International Nickel Co.



FOR REMELT OR PROCESSING

MasterMet alloys are available in shot, ingots and cast billets, bars and special shapes. Often the more common low alloy and 300 and 400 Series stainless steels can be shipped from stock. Remember . . . whatever your needs, Cannon-Muskegon can provide metallurgical engineering assistance in recommending the proper alloy — as well as the proper handling — to assure the best possible casting. Write for bulletin!

Cannon-Muskegon
CORPORATION
2871 LINCOLN STREET • MUSKEGON, MICHIGAN

ARE YOU ON OUR MAILING LIST

to receive inventory data on "in-stock" alloys? You'll find a surprising number of alloys listed ready for immediate delivery. Write today!

MASTERMET
CERTIFIED ALLOYS FOR INDUSTRY

For more information circle No. 21 on the Reader Service Card

Doehler-Jarvis help REGINA floorwaxer

Waxing the floor once took plenty of elbow grease.

Now machines do the muscle work. Do it as you used to – bearing down . . . rubbing hard.

So a mechanical waxer needs a certain amount of weight – as well as speed.

And remember this! A floorwaxer's lot is not a happy one. It should be rugged. What's more, though it hides in a broom closet all its life, it has to look like a million on the sales floor. Compete pricewise, too.

One company . . . The Regina Corporation . . . has done an outstanding job of meeting these requirements. Today, something like four out of every five floor waxers sold are made by Regina.

Regina's methods are deceptively simple. Consider their use of Doehler-Jarvis zinc die castings for base, motor housing, handle swivel, and cover. This one policy, alone, accounts for many of the sales advantages their waxers enjoy.

Take weight! Zinc provides it . . . in just the right measure for efficient polishing combined with easy handling. Die casting helps Regina distribute weight evenly and concentrate it low for balance.

Take strength! Zinc has it and die casting exploits it . . . permitting metal to be concentrated where stresses accumulate, reduced or eliminated where strength requirements diminish or disappear.

Three of Four Big Sales Points stressed by Regina to dealers are founded on the use of Doehler-Jarvis zinc die castings . . . eye catching finish (good die-cast surfaces), efficient polishing action (well-placed weight), rugged serviceability (high-strength metal).

zinc die castings add weight to their sales story

Take appearance! Die-cast zinc surfaces enhance almost any finish you want to name . . . including the new enamels in pastel shades. To get a basic change in shape, as for a new model, Regina simply designs a new die-cast cover to fit.

Take cost! Regina and Doehler-Jarvis engineers work production costs down pretty far. In current models, machining is reduced to light reaming of the bearings, a combination turning operation and the tapping of three holes. Cast-in holes speed assembly with self-threading screws. To save still another operation, servicing instructions are die-cast in bas-relief letters.

There are important cost reduction implications, too, in Doehler-Jarvis service. Regina puts it this way, "We've done business with Doehler-Jarvis for over twenty years. We can count on prompt action when it's called for . . . and when they set up a shipping schedule they hold to it."

This practical type of relationship has been duplicated many times between Doehler-Jarvis and its customers. For Singer, Black and Decker, York, AMF, Underwood and many another blue chip company it's paid off again and again . . . just as it can pay off for you.

So if you are designing a new product or model, look into the possibilities of die castings . . . Doehler-Jarvis die castings.

Doehler-Jarvis
Division of National Lead Company
General Offices: Toledo 1, Ohio

In Canada:
Barber Die Casting Co., Limited
Hamilton, Ontario

*Reg. U. S. Pat. Off.

For more information circle No. 79 on the Reader Service Card

"Hmm—maybe if we modify our tools a bit, we'll reduce our aluminum machining problems"

Good idea, I'll finish my sandwich. Then send for a copy of George Sall's 4-page booklet "Machining Aluminum".

This booklet is written in shop terminology offering economical solutions to everyday machining problems.

Copies of "Machining Aluminum" are available without obligation . . . write to our Metallurgical Department.

This is only one of the research and service facilities offered to industry by our company. In addition to controlling our quality with the most modern techniques known, our Metallurgical staff is always at your service. They will be glad to consult with you on any problems related to non-ferrous metals. We can also develop and produce special alloys for any special requirements you may have.

For superior service in non-ferrous metals, call . . . .

"Visit us at the Foundry Show" Booth #1922

"Better Alloys for Better Castings Through Creative Metallurgy"

The George Sall Metals Co., Inc.

2304 EAST BUTLER STREET — PHILADELPHIA 37, PA.

PRODUCERS OF: Aluminum, Brass and Bronze and Zinc Alloy Ingot; Hardeners, Z-shot and bar for Zamak production; Salloy; Special Alloys

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LETTERS
continued from page 23

SOURCE FOR CASTINGS

We are interested in locating a local (Boston area) bronze foundry (Job-shop) who can give us bronze castings made from plaster molds. Receiving names of any such foundries you can recommend will be appreciated.—A. T. T. (Owner)

Names of the nearest plaster mold foundries have been sent.—Ed.

MORE DATA ON SHAW

Your excellent article in the March issue (Page 84) discussing the "Shaw Process" does not give any indication of how this is available to the trade. Will you please write to me suggesting how I can further my interest in the process.—I. A. C. (Massachusetts)

Will you please advise where die casting molds can be obtained in the Shaw Process. . . You mention the Lebanon Steel Foundry Company and we'd like to know where they may be located and if there are others around our Chicago area.—S. A. G. (Illinois)

We read your article on "Low Cost Molds And Dies By Casting" and are interested in finding out who does casting by this process closest to New York City. G. M. (New York)

Can you tell us where we can get in touch with someone in Los Angeles who is familiar with this Shaw Process?"—G. R. B. (Cal.)

. . . we carry out molding for various manufacturers on a custom basis, and consequently would be very interested in finding out whether this process is being used by any foundries in the United States, especially in our own locality. — R. A. W. (Ohio)

Information has been forwarded. Large number of inquiries have come in from all parts of the country. This issue of PMM carries another article on the Shaw Process, reporting some of its uses for producing commercial castings. It starts on page 40.—Ed.

it's CRUCIBLE REXALLOY

for abrasion, corrosion and heat resistant parts...with better finish

1. One of a pair, this blade of REXALLOY A shears hot glass during manufacture of TV tubes. Liquid cooled between operations, it offers maximum resistance to wear, corrosion, and thermal shock. REXALLOY blades outperform previously used high speed steel shears by a wide margin.

2. Nozzle for jet type oil well rock bit cutter. Made of REXALLOY 51, it stands up exceedingly well under severe cold abrasive conditions encountered in drilling oil wells.

3. Extrusion die insert of REXALLOY 33. Inside contours are cast within a few thousandths of finished size. REXALLOY inserts produce as many as six to ten times as many pushes as conventional hot work tool steel extrusion dies.

Here's what Crucible REXALLOY means to you: Castings of high hardness, even at elevated temperatures . . . excellent resistance to both corrosion and abrasion . . . smooth, clean finish.

What's more, REXALLOY castings, when made by the shell-mold process, can be cast to any shape. Dimensions are held to closer tolerances than ever before . . . practically all machining and grinding operations are eliminated—especially important with hard super-alloys like REXALLOY.

So if your application calls for a part with one or more of these characteristics, REXALLOY shell-molded castings are the answer. They are moderate in price (less than investment castings), closer in dimensions and finish than conventional castings. Let your Crucible representative give you the complete story of what they can do for you. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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THIS JOB WAS TOUGH SO TWIN CITY GOT IT!

When Denison-Johnson Corporation of Mankato, Minnesota, gave the production go-ahead on their new Century Selecto-Dial Spinning Reel, precision and economy—*plus* eye appeal, were three big musts.

Cooperating closely with the manufacturer, Twin City engineers designed dies for the aluminum outer case and two zinc gears. Customer specifications for all parts were met and held throughout production runs.

Result: An outstanding new spinning reel, now proving itself on lakes and streams across the nation—a sales-builder wherever sold!

Get the facts for yourself on Twin City's ability and willingness to work with your designers and engineers. Send sample or blueprint or ask for free color brochure.

TWIN CITY DIE CASTINGS CO.
3351 TALMAGE AVE. S.E. • MINNEAPOLIS 14, MINNESOTA

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A review of recent U.S. PATENTS

Copies of all patents reviewed can be secured from U. S. Patent Office, Dept. of Commerce Washington, D. C. for 25¢ each.

A PROCESS FOR PROTECTING ZINC against corrosion. The zinc or zinc surfaced article is immersed in an aqueous solution of from 0.5 to 5.0 percent by weight of nitric acid, 1.82 to 9.1 grams per gallon of chromic acid and 1.59 to 7.95 grams per gallon of fluorine in the form of a water soluble fluoride compound. This latter compound is selected from a group of trifluoroacetic acid, fluoboric acid and the lower alkyl esters of these acids.

(Patent No. 2,727,841—Method and Composition for Improving Corrosion Resistance of Zinc—Allan E. Chester—assigned to Poor & Co.—issued Dec. 20, 1955).

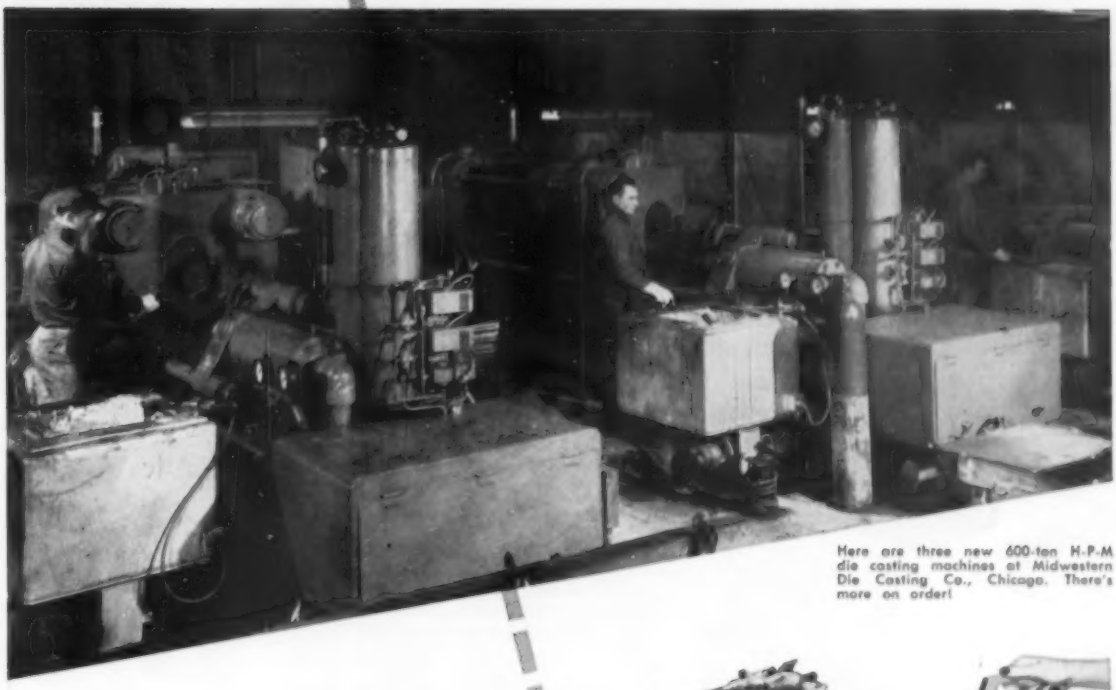
ELECTROPLATING NICKEL ONTO MAGNESIUM and magnesium alloys is accomplished by first cleaning the article to be plated in a dilute acidulated aqueous solution of a fluoride selected from the group consisting of hydrogen fluoride, ammonium bifluoride, sodium bifluoride and potassium bifluoride. The cleaned article is then rinsed in water and, without drying the article is immersed in the plating bath. The plating bath is an aqueous solution containing nickel bifluoride and hydrogen fluoride; the pH is maintained between 1 and 3 and the bath contains in addition from 10 to 50 grams per liter of an organic polybasic acid compound from the group of citric acid, tartaric acid and their alkali earth metal salts.

(Patent No. 2,728,720—Method of Producing an Electroplate of Nickel on Magnesium and the Magnesium-base Alloys—Herbert K. De Long—assigned to the Dow Chemical Co.—issued Dec. 27, 1955).

A CEMENTED CARBIDE COMPOSITION consisting of from 60 to 90% by weight of macro-crystalline tungsten carbide in which more than 50% of the carbide crystals are larger than 25 microns. From 5 to 30% by weight of an additional carbide selected from the ground of the carbides of titanium, tantalum, columbium or zirconium. From 1.5 to 10% by weight of a cementing material selected from cobalt, nickel, iron or a mixture of them.

(Patent No. 2,731,710—Sintered Carbide Compositions—George W. Lucas and Carl S. Wiedman—assigned to General Electric Co. —issued Jan. 24, 1956).

MIDWESTERN CHOSE H-P-Ms
for more die casting value per dollar...



Here are three new 600-ton H-P-M die casting machines at Midwestern Die Casting Co., Chicago. There's more on order!

These Facts Add Up...

All new—from stem to stern—that's H-P-M's Die Casting Machine. Result? Better die castings for you. H-P-M's new exclusive mechanical link-wedge lock is the heart of the new design. There's plenty of "beef" in locking and frame members. The clamp is preloaded to full rated tonnage . . . reducing flash . . . producing parts to accurate dimensional tolerances . . . improving quality and density. Let H-P-M engineers show you the "more value per dollar" facts. A national survey reports die castings will be used in 74% of new products being designed. Are you ready for more business?

The Dormey Hand Mixer and Dormeyer Friwell are typical appliances incorporating die cast parts made at Midwestern. The motor housing of the mixer and the deep well of the Friwell are currently in production.

Write for Bulletin 5400

DIE CASTING DIVISION
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio U.S.A.

HPM

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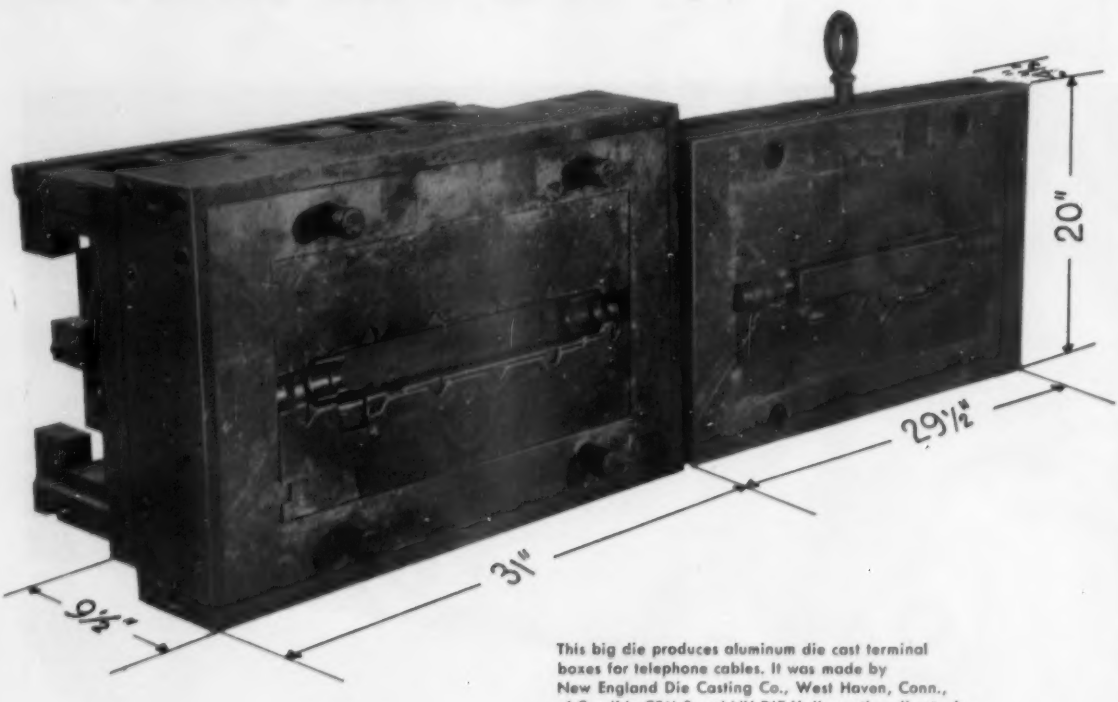

This big die produces aluminum die cast terminal boxes for telephone cables. It was made by New England Die Casting Co., West Haven, Conn., of Crucible CSM 2 and NU DIE V die casting die steels.

it's made of

ultrasonically inspected

CSM 2 and NU DIE V

...from Crucible warehouse stock

The die above, built by New England Die Casting Company, West Haven, Connecticut, casts aluminum electrical terminal boxes. The holder block is prehardened CSM 2 – the insert NU DIE V – both promptly obtained from local Crucible warehouse stocks.

Crucible CSM 2 and NU DIE V are made for and inspected to die casting steel quality. They're an unbeatable combination – perfect for holder blocks, solid dies, inserts or sleeves – for any die casting application.

What's more, delivery is from local warehouse stock – in 438 sizes – 1" to 40" wide . . . ¾" to 15" thick – all ultrasonically inspected. You just can't beat Crucible die steels for quality or availability. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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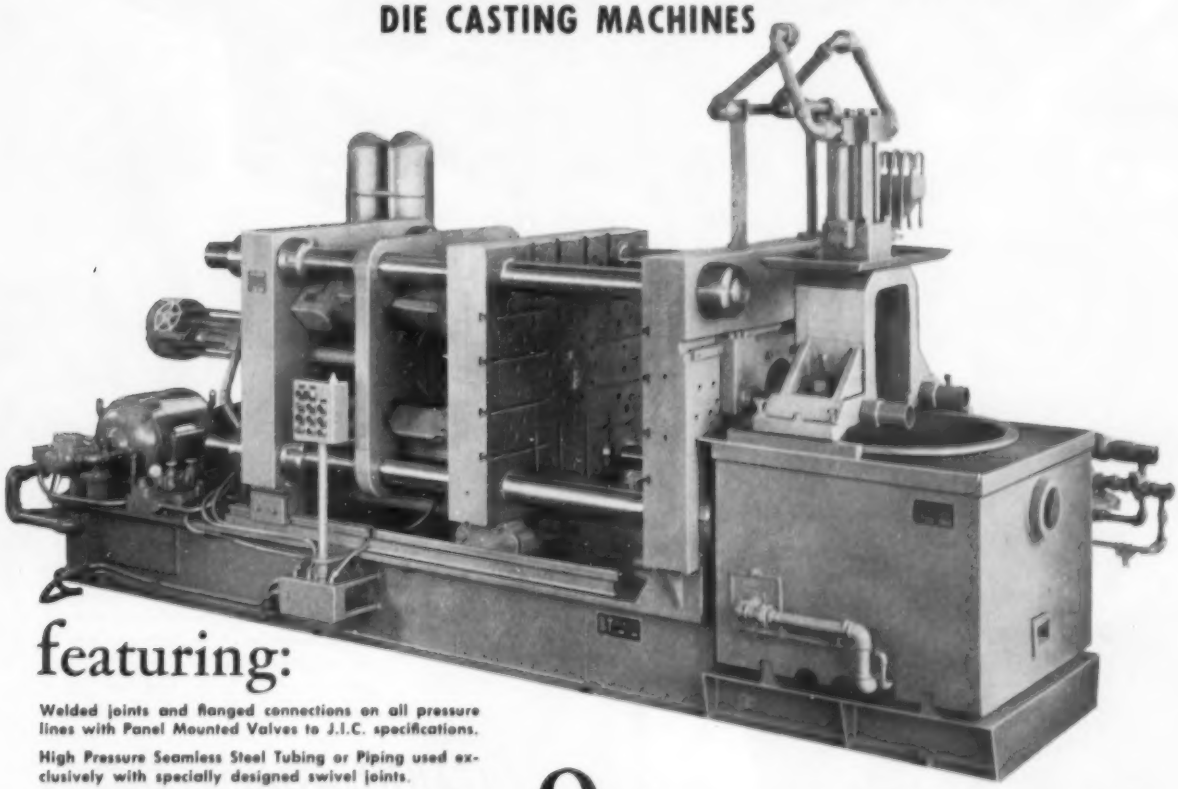
B&T DIE CASTING MACHINES

DESIGNED AND BUILT TO THE SPECIFICATIONS OF PRACTICAL, LONG-TIME SPECIALISTS IN THE DEVELOPMENT AND CONSTRUCTION OF DIE CASTING MACHINES



featuring:

Welded joints and flanged connections on all pressure lines with Panel Mounted Valves to J.I.C. specifications.

High Pressure Seamless Steel Tubing or Piping used exclusively with specially designed swivel joints.

Model illustrated is our B&T-700P2. 750-ton locking pressure. 29" between bars, with 5" bars.

9 MODELS TO CHOOSE FROM:

ranging from 150 to 750 tons. Available for zinc, aluminum, magnesium and brass. Write or phone for complete details.

VACALOY DIE CASTING PROCESS:

B&T zinc die-casting machines incorporating this system are now in successful operation.

B & T ENGINEERING and SALES COMPANY
112 MADISON AVE.
DETROIT 26, MICHIGAN
PHONE: WO 5-3140

B & T MACHINERY COMPANY PHONE 2341 201-217 Eighth St. Holland, Mich.

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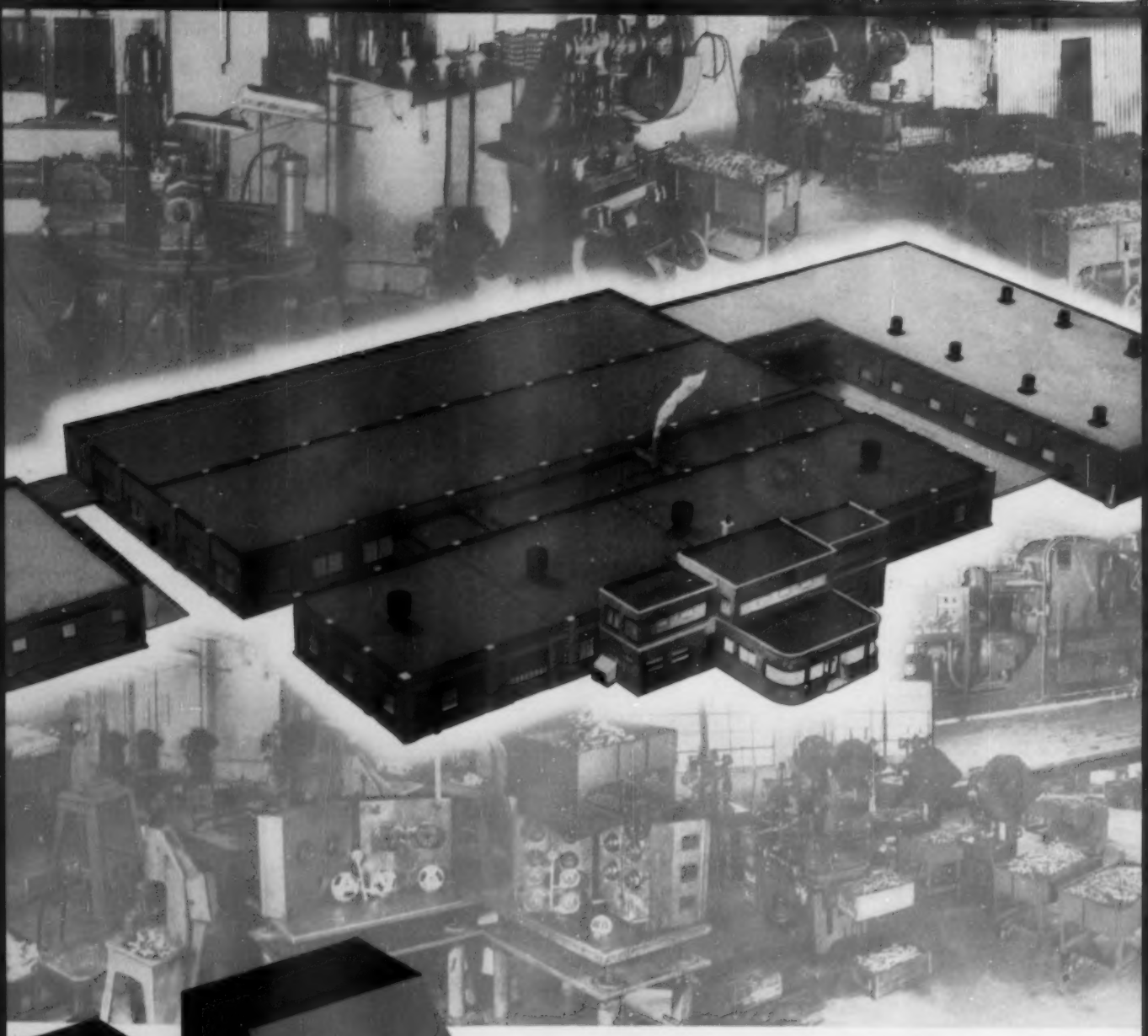

NE

60,000 square feet of complete, modern die casting facilities

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NEW ENGLAND DIE CASTING CO., WEST HAVEN, CONN.

In 1955, More Die Castings Were Bought . . .

BY NOW, everyone concerned with the die casting industry knows that 1955 was the best year on record for production and sale of die castings. It has remained for the American Die Casting Institute, Inc., to come up with the statistical evidence, based on reports of its members.

Just out is the report on metal consumption, production and sales issued by ADCI secretary David Laine, showing strong gains by all three major die casting alloys. Here are some high points of the report:

The 385 million pounds of aluminum used by the die casting industry, over 9% of the total aluminum supply, includes 352 million pounds for aluminum die castings, 33 million pounds for use in zinc base die castings.

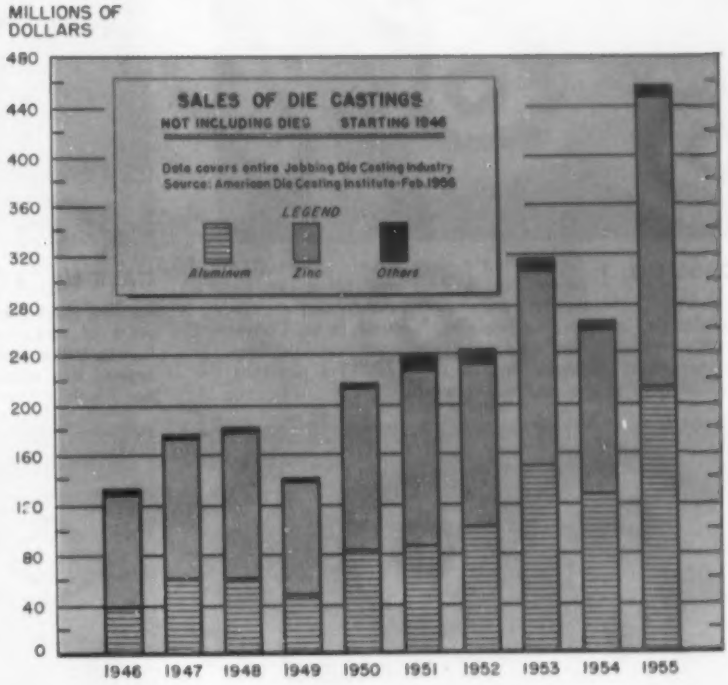
More than 75% of the aluminum was supplied by the smelting industry. Die casters took about 55% of the total aluminum ingot sold by the smelters.

The 410,000 tons of slab zinc used in die castings represented 40% of the total slab zinc output. For the first time in history, special high grade zinc outsold any other grade of slab, displacing prime western for the first time.

Job shops shipped 67% of the zinc and 77% of the aluminum die castings. The larger "captive" producers are also substantial buyers of die castings, with present indications that they will continue to both buy and make in increasing volume, but at relatively stable ratios.

Sales value of job shop produced die castings reached $457,500,000, exclusive of value of plating or other finishing, or the cost of dies and other tooling. Value of such sales and charges is estimated to be in excess of $250,000,000. Previous high year was 1953, when sale of die castings totaled $319,000,000.

Breakdown by alloy shows sales as follows: zinc die castings $232,000,000; aluminum die castings $214,000,000; magnesium die castings $6,500,000 and brass die castings $5,000,000.

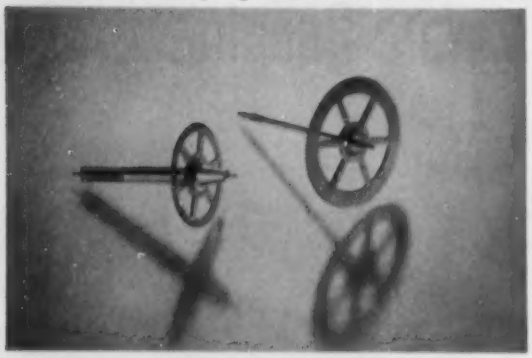


...For A Wider Range of Products

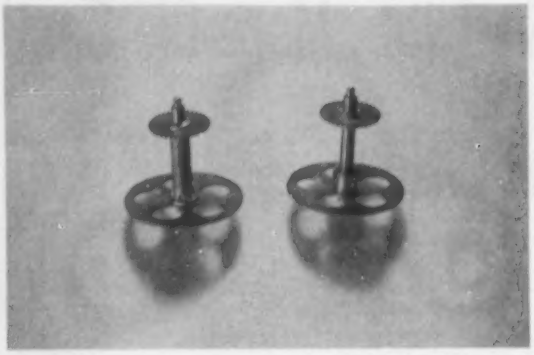
END USE INDUSTRY GROUPS	ZINC Percent Of Total	ZINC Estimated Lbs.-1955	ALUMINUM Percent Of Total	ALUMINUM Estimated Lbs.-1955	MAGNESIUM Percent Of Total	MAGNESIUM Estimated Lbs.-1955
Agricultural Equipment; Mining, Constr. Mach.	1.1	6,000,000	2.3	6,250,000	0.1	6,500
Automotive (motor vehicles except military)	59.6	327,000,000	43.3	117,000,000	37.5	1,950,000
Other Transportation (except Military)	0.9	5,000,000	1.5	4,000,000	0.6	30,000
Industrial Machines & Tools; Commercial Equip.	6.7	37,000,000	15.0	40,000,000	34.6	1,800,000
Electronics	1.6	9,000,000	0.8	2,250,000	0.2	12,000
Office & Business Equip.	2.1	11,500,000	4.6	12,500,000	6.1	320,000
Builders Hardware; Plumbing and Heating	4.7	26,000,000	2.7	7,300,000	0.5	23,500
Photo, Optical Recording, Scientific & Measuring Devices	2.0	11,000,000	5.3	14,500,000	1.6	85,000
Timing Devices, Clocks	1.0	5,500,000	1.1	3,000,000	0.1	5,000
Home Appliances	18.5	102,000,000	18.7	50,500,000	7.6	395,000
Toys; Jewelry; Personal and Sporting Goods	1.2	6,500,000	2.1	5,700,000	0.5	23,000
National Defense	0.6	3,500,000	2.6	7,000,000	10.6	550,000
TOTALS BY METALS	100.0	550,000,000	100.0	270,000,000	100.0	5,200,000

Totals represent all job shop sales. Source: Reports of Members to American Die Casting Institute.

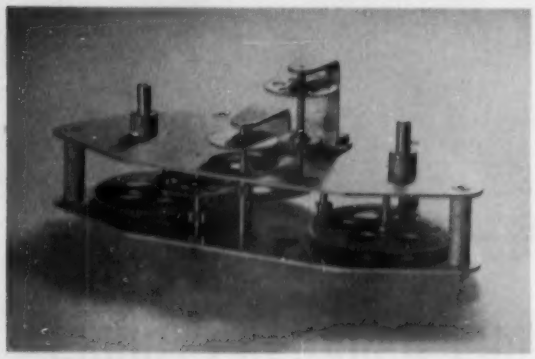
Six assembly jobs that have been simplified . . .



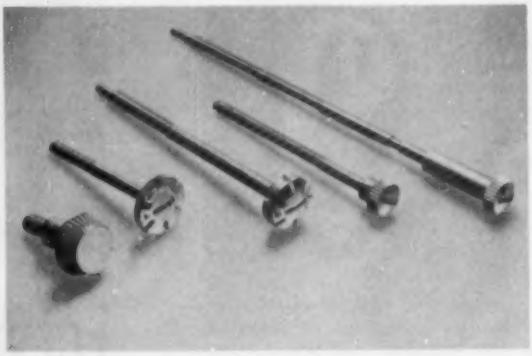
CASE NO. 1 Assembling a gear onto a shaft (R) or assembling a gear and pivot pin onto a shaft (L) can be done faster and with greater accuracy by die casting low melting alloy around them. Concentricity would be less accurate if the pivot were machined on the shaft, or were formed by pressing a pin into a drilled hole in the end of the shaft.



CASE NO. 2 Assembling two gears onto a single shaft is usually done by machining shoulders on the shaft and staking the gears against them (R). As a die cast assembly (L), the gears are held in the die halves and metal cast around the shaft to hold them. A system has been developed for casting onto commercial bar stock without flash.



CASE NO. 4 Complete gear train for meter is made up of subassemblies produced by die casting. Note that the pinions formed on the shaft, either adjacent to a gear or separately, have been die cast. This is a "bonus" gained as part of the assembly operation.



CASE NO. 5 Attaching special knobs to a shaft can be done by die casting them in position. The special advantage of this is the saving of extensive machining to cut the piece from heavy bar stock. It permits introducing screw heads, special knurling, etc.

ASSEMBLING small parts can be troublesome and expensive. Not only is it difficult to hold parts within tolerance limits when you stake or braze small screw machine parts and stampings together, but it can be uneconomic and unsatisfactory from a performance viewpoint.

A technique developed a few years ago for the manufacture of electric meter components is now available generally and may solve many problems related to the assembly of small parts.

How It's Done

The process uses a specialized, bench-size die casting machine built by Fisher Gauge Works, Ltd., and needs ingenious tooling.

Parts to be joined are placed in the die cavity in much the same fashion as conventional inserts are positioned. A low melting alloy based on lead, tin or zinc is forced into the die by means of an injection assembly that is operated by air cylinder. The metal forms a solid joint between the members of the assembly.

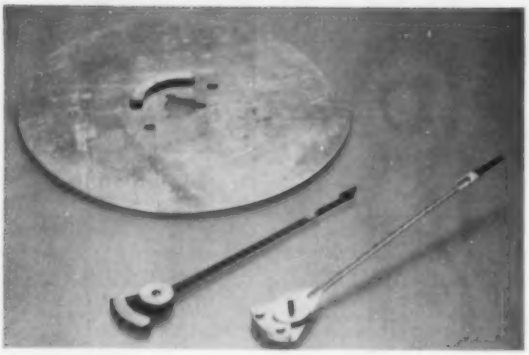
When the die is closed and rotated manually on its axis 15 degrees, metal is injected automatically as soon as the die opening contacts the nozzle. On assembly operations, production of from 250 to 800 pieces per hour is possible, depending upon the number and complexity of the components being assembled.

Average operating cycle for assembling two simple pieces, such as a wheel onto a shaft, requires about five seconds. Actual metal injection can be controlled from .1 to 1.2 seconds.

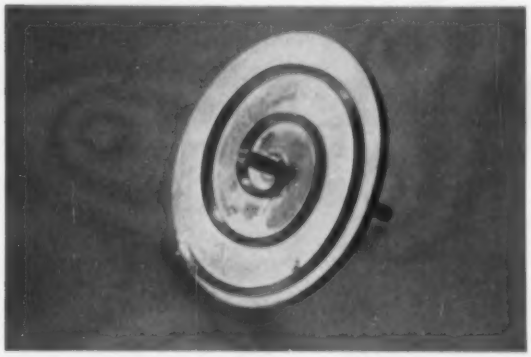
The melting pot, heated by a 2000 watt element, operates on a 220 volt, 60 cycle, single phase line. Gooseneck on the larger machine has a capacity of about two ounces.

What Can You Do?

As mentioned above, the unit was developed as a means of assembling gears and pinions on their screw machine shafts for electric meters. Two plants which have used this system for a number of years on meters are the Summersworth, N.H., plant of



CASE NO. 3 Counterweights can be positioned on a piece of sheet metal in the same operation that forms them. Here, the die cast metal flows through holes punched in the sheet, and, in effect, forms its own rivet. Position and weight of the counterweight can be very accurately controlled by this system. This is far less expensive than mounting by riveting, screwing, etc.



CASE NO. 6 Mounting a die casting by means of die casting may sound confusing, but actually is useful to aid in maintaining concentricity between OD's. This die cast zinc rotating member for radiosonde equipment is held to its shaft by injecting metal between the two members.

You Can Assemble Small Components By Die Casting

. . . and the machine that does it

the General Electric Co., and the Raleigh, N.C., plant of Westinghouse.

What other jobs can be done? Here are a few that have already been accomplished on a production basis:

1. Attaching a flat disc or gear to a shaft;
2. Attaching two discs to a shaft;
3. Attaching a pivot point to a gear and shaft;
4. Attaching an internal pivot point inside a small diameter hole;
5. Forming odd-shaped heads on screws;
6. Mounting a counterweight onto a sheet;

Continued on page 120

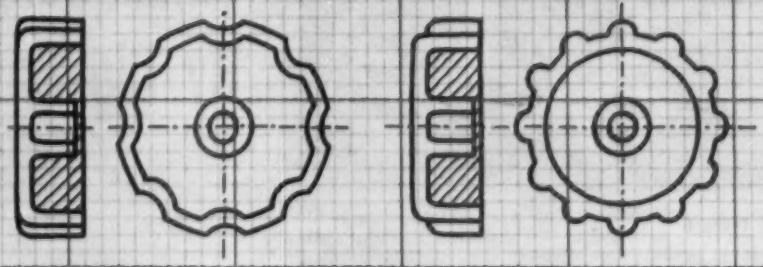
HIGH SPEED is one feature of this setup for attaching gears to their shafts. This tiny die casting machine is specifically for this type of work.

DESIGN POINTERS
FOR DIE CASTINGS

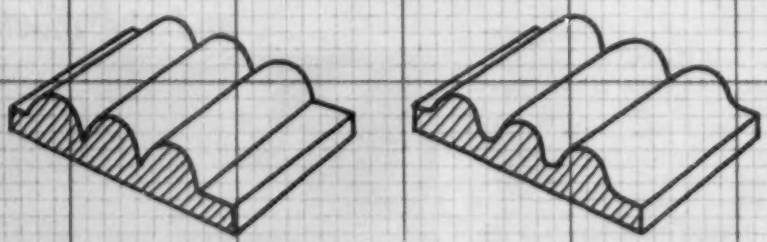
Money Savers

Sometimes you can save money, improve your product and get into production faster if you observe these suggestions for detailing your die castings. They have been submitted by some of the leading die casting producers to help you in designing.

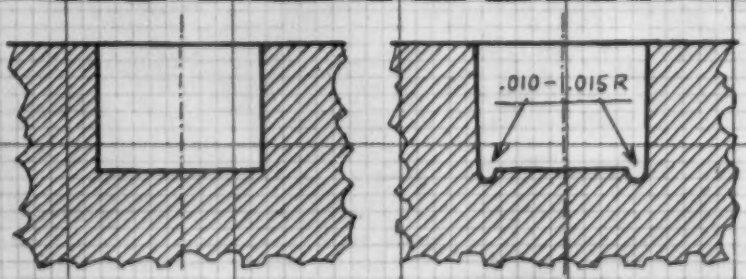
Convex finger grips are easy to mill into die; concave notches are difficult & expensive.



Fillets between beads avoid knife edges on die.

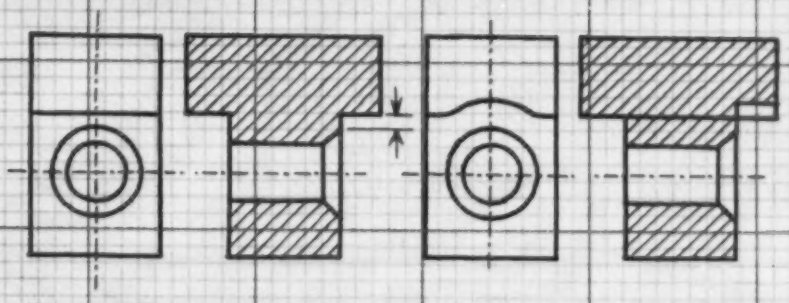


Cast sharp interior corners: difficult to maintain; radius improves design.

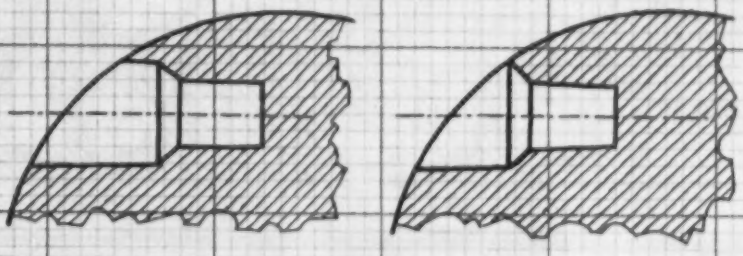


UNDESIRABLE

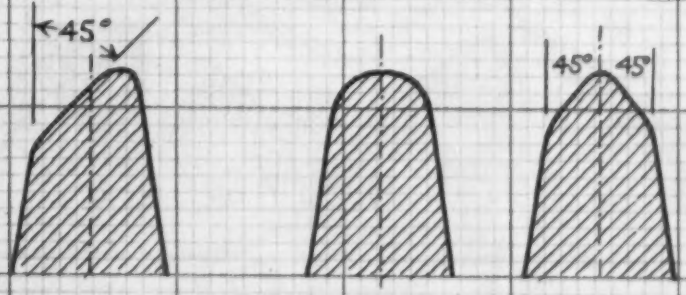
DESIRABLE



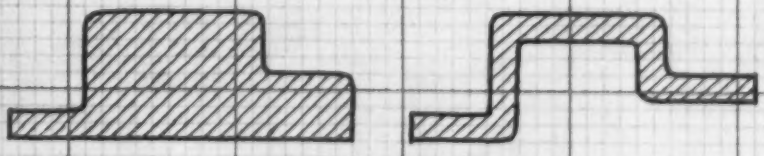
Avoid thin walls in die around cores.



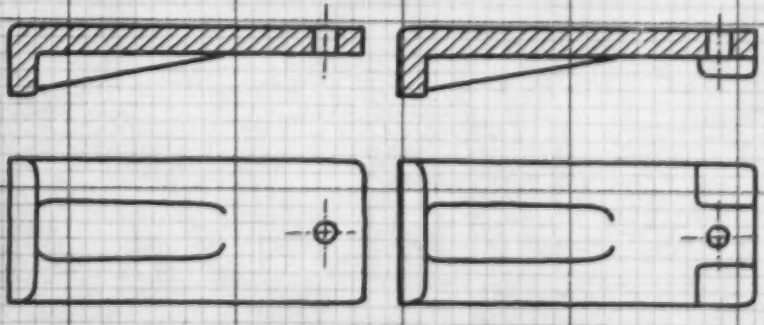
Thin cast section is difficult to fill.



Some contours are easier than others to mill into die.

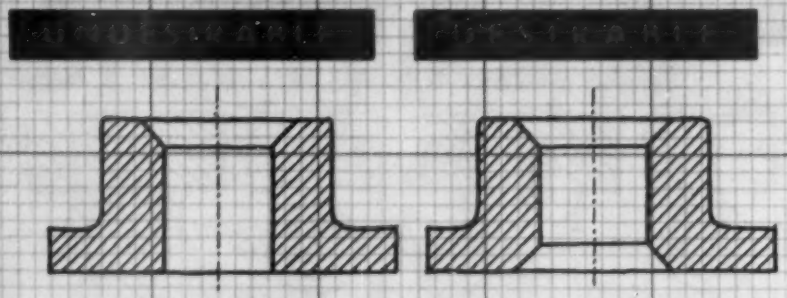


Wall sections should be uniform where possible.

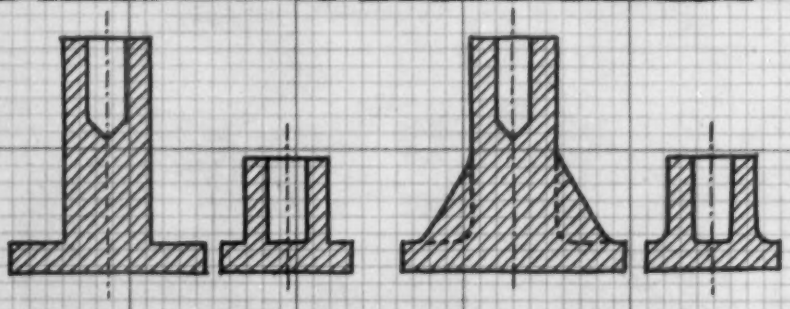


If possible, provide bosses to relieve tension on core.

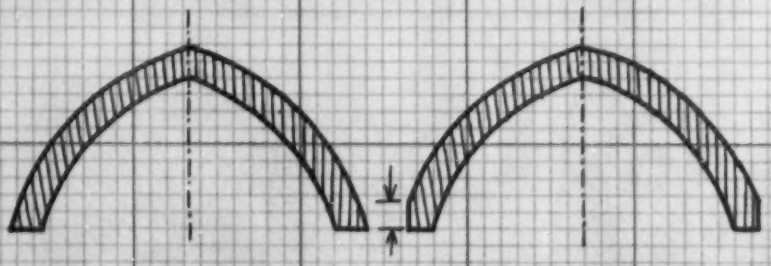
Cored thru holes that are to be tapped should have c'sink on both sides.



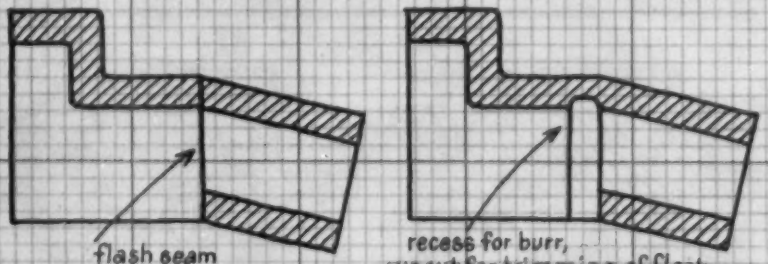
Ribs and/or fillets improve bosses.



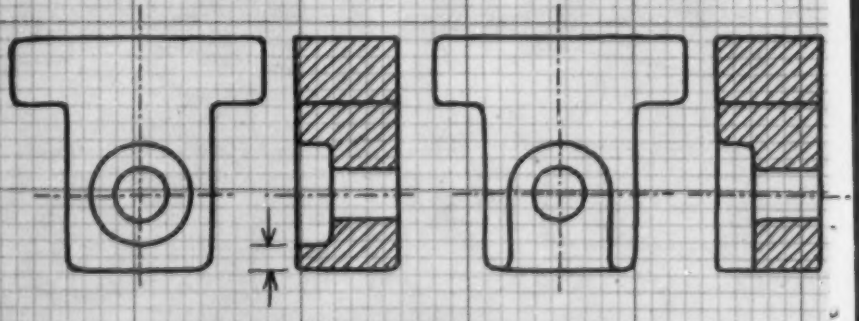
Allow .030 min. flat at parting line for gating and trimming.



Simplify flash and burr removal on inside surfaces

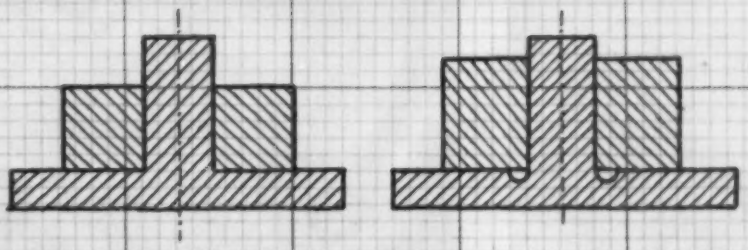


Extending c'bore eliminates thin wall and undercut.

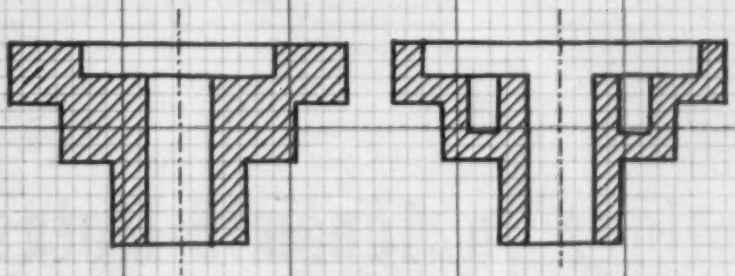


UNDESIRABLE

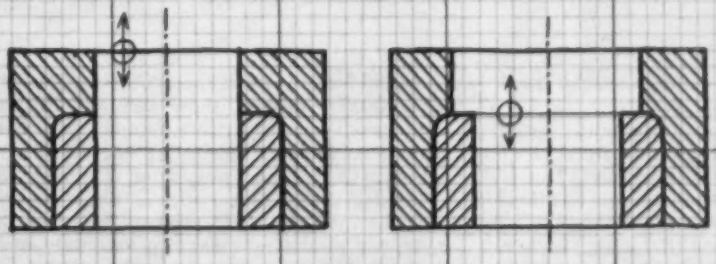
DESIRABLE



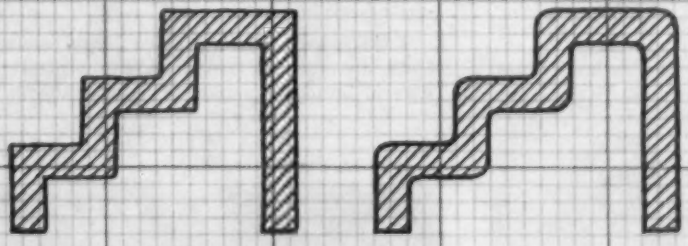
Where corners must fit together on two castings allow a relief.



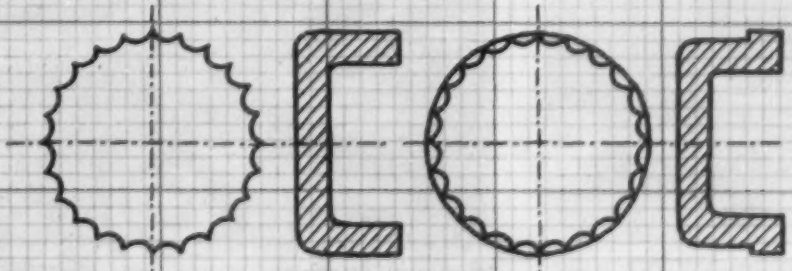
Add ribs for strength where heavy section has been cored to gain uniform wall.



Split core to hold insert firmly during casting.



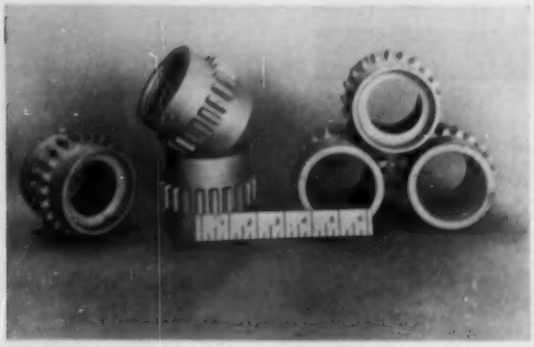
Provide maximum radius on all corners



Provide bead on scallop to simplify gating and trimming

THANKS are due to: Aluminum Company of America, Cleveland Hardware & Forging Co.; Bellas Hess Div. of Phoenix Aviation Corp.; Federal Die Casting Co.; Hyatt Bearings Corp.; The Moore Co.; Litemetal Diecast Inc.; Monarch Aluminum Mfg. Co.; and New Jersey Zinc Co.

More next month



GEAR CASTINGS of almost unlimited size range can be cast by Shaw process, giving clean tooth detail. Small runs and experimental quantities are said to be practical. It may help in producing gears in hard-to-machine alloys.

TURBINE BLADES are among parts in this group from Lebanon Steel Foundry. Others are: stainless steel high speed impeller blade, aircraft fuel valve, bottling cap guide, pump impellor, and steam turbine guide vane.

Where Castings In Ceramic Molds Fit

WHEN any new metal-fabricating method is introduced, the questions naturally arise: "Where does it fit into the general manufacturing picture? Will it be economical to use in my products? For what types of applications is it best suited?"

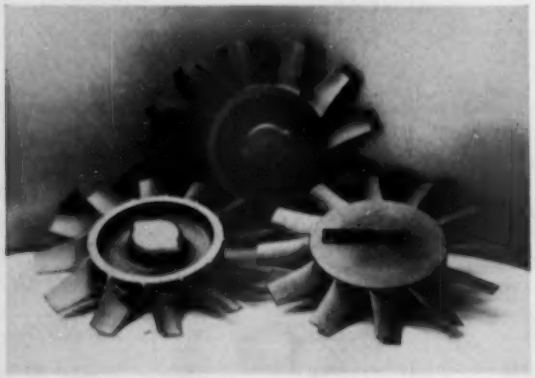
A great deal of active interest of this type has been shown in the Shaw process, precision casting technique recently introduced into the United States from Great Britain. This process, which uses split ceramic molds*, claims many special features that may offer solutions for specific production problems.

Presented here are illustrations of the range of components for which the process seems to be most appropriate. Most of these pictures illustrate castings produced in British foundries, although one American foundry has so far been licensed to produce castings by this process on a jobbing basis.

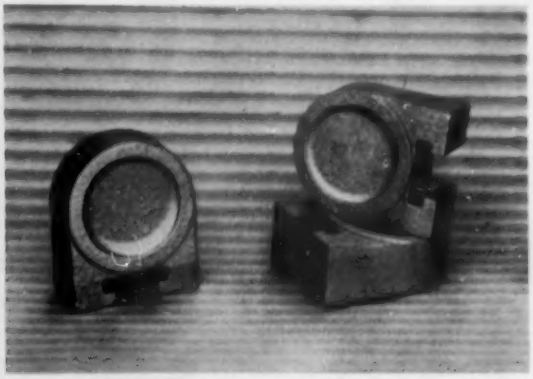
Among the characteristics of Shaw process which may be most useful to product designers seeking a means of producing difficult pieces, are:

- *Ability to cast thin sections of large area,* including the production of pieces with knife edges and thin walls down to 1/16".
- *Ability to produce extra large castings within close dimensional limits,* including pieces weighing several hundred pounds in ferrous alloys.

* See "Low Cost Molds and Dies By Casting," PMM, March 1956, p. 84.



IMPELLORS cast in a heat resisting steel, illustrate the thin sections and knife edges that can be produced.



STAINLESS STEEL valve wedges have been cast by Shaw process for use in gasoline pipe line.

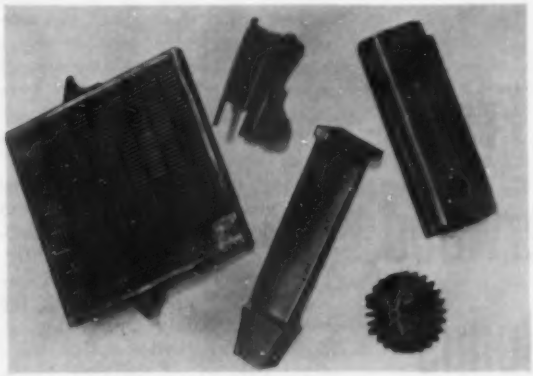
ALUMINUM ALLOY can be cast by this process, although it is less common than the ferrous alloys. All of these castings except the two in lower right corner, are in aluminum, the other two are in bronze.

Into Your Products

- *Simple and inexpensive patterns,* which make it practical to produce castings in small quantities or for prototypes.
- *Short lead time,* permitting production of first castings in a matter of hours after completion of the pattern.
- *Smooth surfaces,* commonly cast to approximately 125 micro-inches when good surface polish is present on the pattern.

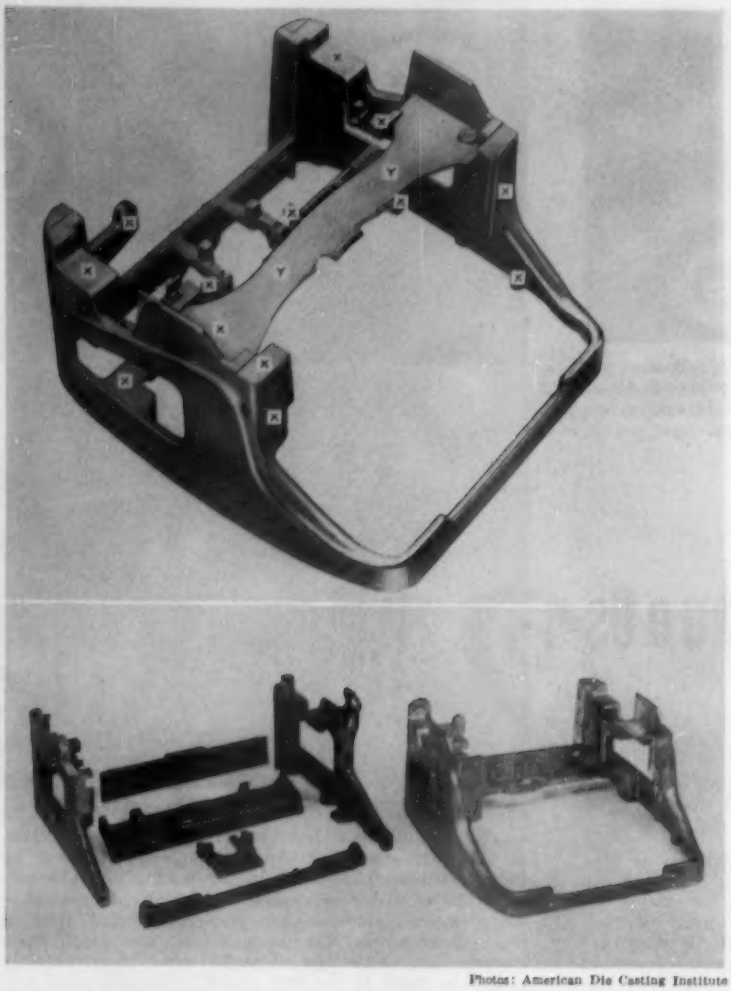
While this process is probably most applicable for the ferrous base alloys, including stainless and tool steels, it also is suitable for casting the lower-melting alloys based on aluminum or copper, and the higher temperature alloys of cobalt.

HOT GAS FAN IMPELLER, 34 inches in diameter, has 56 accurately contoured blades between ¼-inch thick plates. It was cast experimentally in heat-resistant steel by Samuel Osborn Ltd., Sheffield, England, without distortion. The mold for producing the impeller is shown at top. Note the interlocking pieces, produced from a single pattern box. One-piece casting was much more successful than an earlier attempt to cast blades separately and weld them to the end plates.



FILTER PRESS part, steel forming tool, turbine blades and a diesel engine head are cast in steel alloys.

SMALL STEEL COMPONENTS grouped here are cast in alloys ranging from 0.2 carbon to 12 Ni-2W steel.



Photos: American Die Casting Institute

E PLURIBUS UNUM would be an apt slogan for the die caster who has replaced six iron sand castings with a single aluminum die casting. Surfaces marked X, above, show where machining or assembly on the iron frame has been eliminated completely on the die casting. Surface marked Y is the die casting gate, retained during machining for extra strength, and removed afterwards.

How A Redesigned Frame Gives Underwood A Finishing "Bonus"

TO REDUCE weight, maintain low production costs and modernize their standard typewriter, engineers of the Underwood Corp., Hartford, Conn., have effected a major product improvement with a one-piece aluminum die cast main frame, which replaces the former assembly of six iron sand castings.

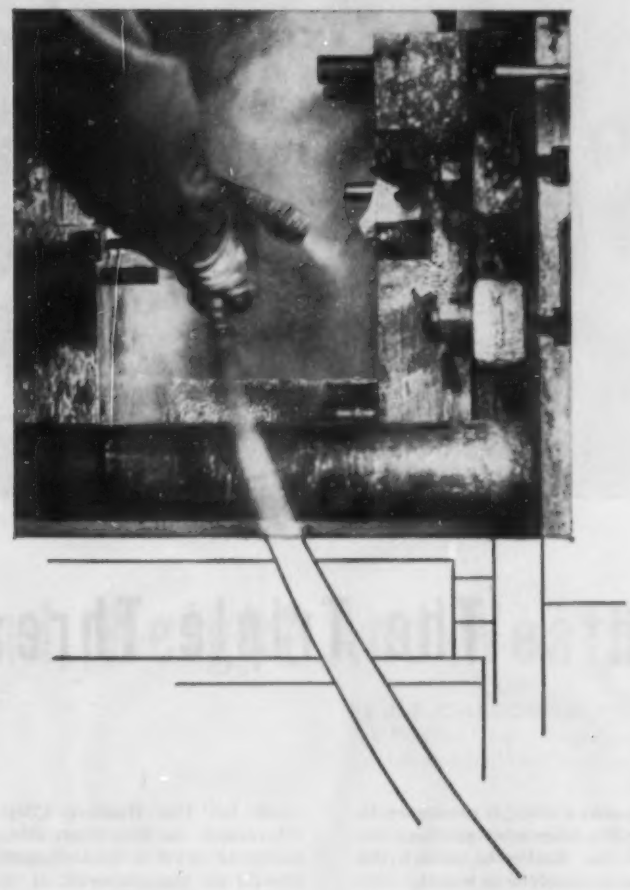
The immediate advantages of the changeover are obvious: (1) rigidity of the frame—markedly increased; (2) weight — 4½ pounds less; (3) assembly of the frame—eliminated; (4) much machining of the frame — eliminated; and (5) many fasteners and other parts—eliminated.

Add to these savings one of the major advantages of die casting—its ability to produce metal components with a very smooth surface. For Underwood, the design and production of a dense, nonporous, smooth die cast frame eliminated the requirement for a primer coat in the finishing process. This translates into a bonus for Underwood. Credit for these economies is given to a job shop die caster, who cooperated in the early design stages.

Die cast aluminum (ASTM Spec. B85-52T, Alloy SC 84A) was specified for the frame because of its strength characteristics combined with lightweight. Many cores in the single cavity die provide the frame's various undercuts and intricate shape. These walls, characteristic of die casting, are a key factor in keeping the weight down on each of the 120,000 frames produced annually. A web of metal connecting the sides of the casting is left intact throughout the machining cycle, to provide extra rigidity and to insure dimensional accuracy. Afterwards, the gate is removed in a punch and die.

The one-piece die cast frame gives Underwood a "built-in" strength and dimensional stability that eliminates variations often occurring in assembled constructions. Because of this unity, Underwood has been able to design "open" sides and back for ease of assembly and servicing. Externally drilled holes were eliminated, since the new frame provides for vertical mounting of the typewriter mechanism.

'dag' dispersions . . . *a touch does so much!*



Bendix uses 'Aquadag' to boost die-casting production

The die-casting of magnesium and aluminum presents unusual problems that make the selection of a die lubricant vitally important. Bendix Foundries, Bendix Aviation Corporation, Teterboro, N. J., has found **'Aquadag'**, a dispersion of colloidal graphite in water, most effective in the quantity production of magnesium jet-engine components and aluminum instrument die-castings.

Standardizing on a simple, economical 1:40 dilution of **'Aquadag'** in water, Bendix finds that the thin, tenacious *dry lubricating film* formed on the dies by this blend produces consistently uniform die-castings. In addition, easier parting, reduced tendency for the molten metal to alloy with the steel dies, and less frequent application, have all helped to increase production substantially.

Full information, telling how **'dag'** dispersions can improve your die-casting production, is contained in the Acheson Bulletin 425 on Metal Casting Operations. Write for your copy today. If you have a specific problem there's an Acheson service engineer in your area who will be glad to work with you.

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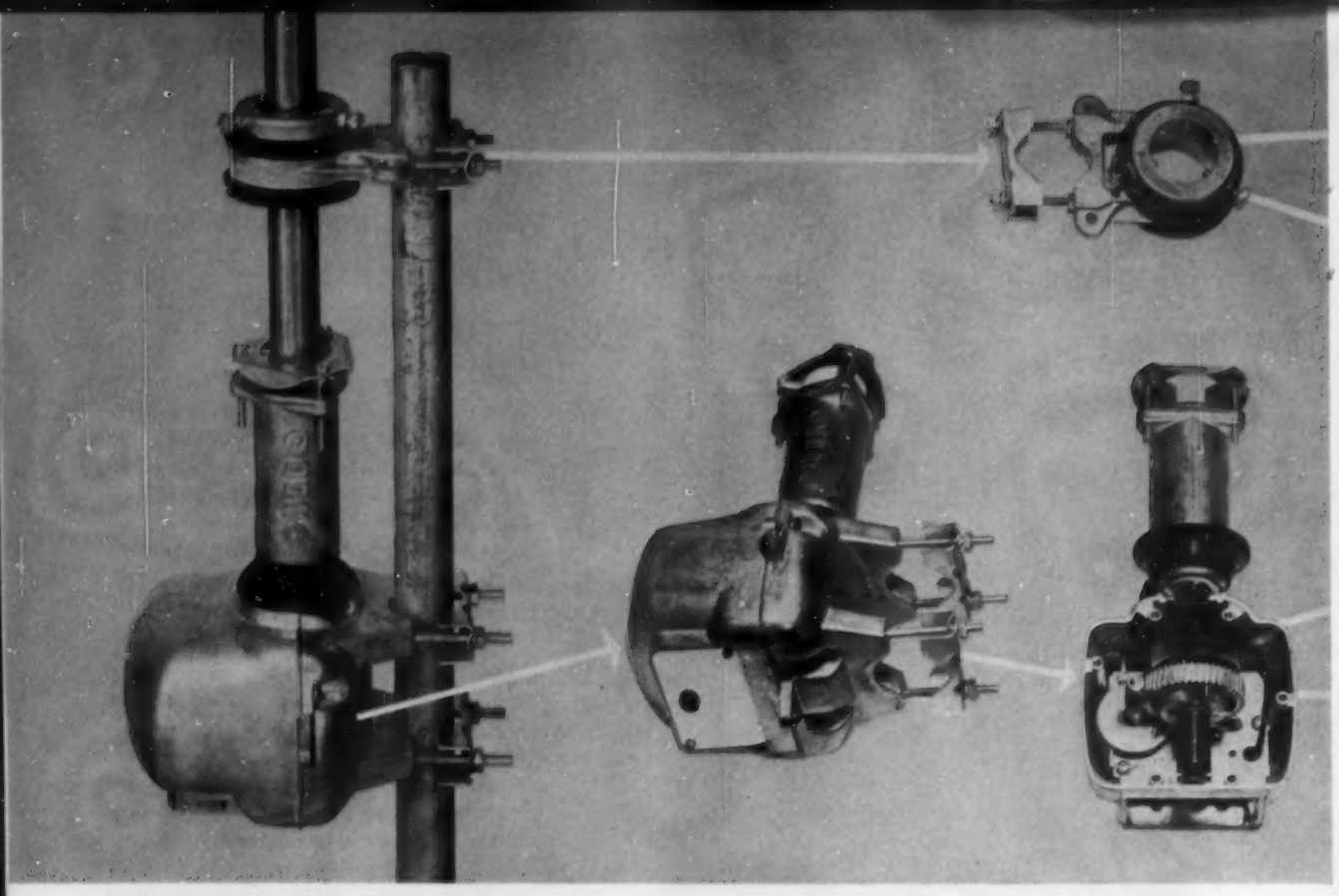


The roof-top unit that rotates your television antenna has been designed to meet . . .

The Triple Threat:

GOOD design in both the mechanical and aesthetic sense, will take into account the advantages as well as the limitations of the most desirable material of construction. Thus, when the basic design of a television antenna rotor was undertaken, die cast aluminum and zinc components were selected for several of the members and the unit designed to fit both the material and the method of manufacturing most economically.

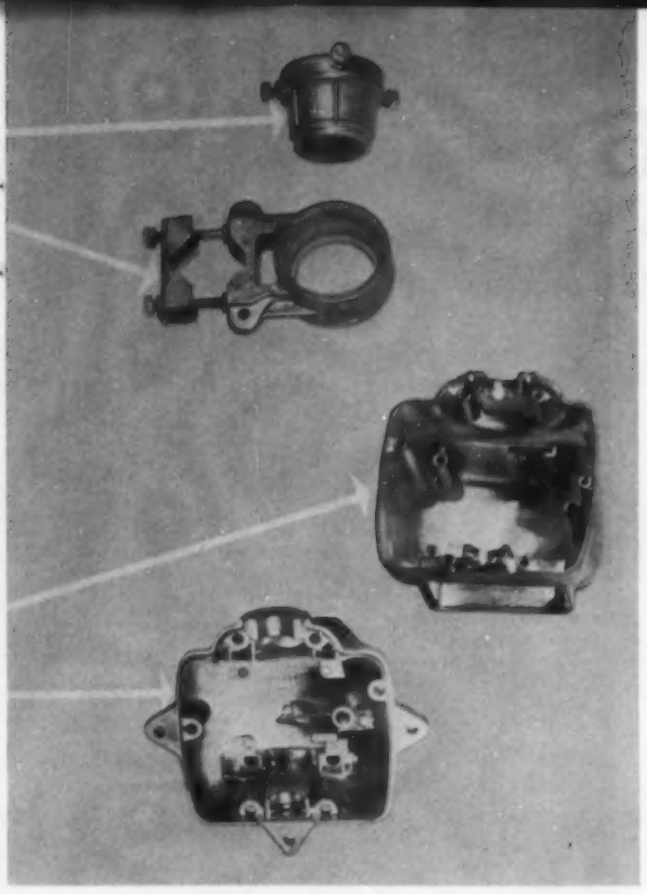
For best reception of television signal at the receiver and maximum picture quality the television receiving antenna should be oriented toward the transmitting television station. In some areas, particularly rural and fringe areas, the transmitting stations are located geographically in different directions; consequently, in these areas a rotor is necessary to rotate the television antenna towards the station to which the television receiver is tuned.

Obviously, if these rotor units were to have widespread use, they would have to be priced low enough so that there was not a great investment involved by the time they are installed. Equally obvious, if the units were to sell at a moderate price, as many components as possible had to be die cast in either zinc or aluminum. As finally designed, the rotor uses two aluminum die castings in the outboard bearing and four die castings in the rotor unit proper. Another economical casting, in this case an aluminum permanent mold casting, is used in the chimney mount.

Figure 1 shows the latest design of the antenna rotor developed by The Radiart Corp. of Cleveland. In this illustration, a mounted rotor is shown which, it should be remembered, is from five to eight feet below the antenna proper so that even in a moderate wind, a very considerable stress can be developed at the outboard bearing of the rotor assembly.

In actual fact, the design of the entire assembly is such that when tested under tornado conditions the mast, a 1-5/8″ diameter aluminum tube, failed in bending so that no damage was done to the rotor. In other words, the rotor and its mount will stand a greater load than the mast when loaded as a cantilever beam.

Obviously, this entire load must be carried by the outboard bearing and its clamp. Here the design of the aluminum die castings



1. HEAVILY LOADED, not only by the physical weight of the antenna and mast, but also by the stresses applied by wind action and by the rotation of a cantilevered superstructure, these units have to be built sturdily . . . yet inexpensively, to meet the competition in a consumer market. Die cast zinc and aluminum parts have been the answer.

COVER STORY

Wind, Weight And Weather

By J. P. CHADOWSKI, Chief Engineer
The Radiart Corp., Subsidiary
Cornell Dubilier Electric Corp.

is such that any failure that might possibly occur would be in the threads that hold the studs in the casting and experience has shown that the castings are no more likely to fail than the steel bolts.

Under all conditions, it is assumed that the antenna must be rotatable. In a wind of any magnitude, there will be a considerable lateral thrust in the bearing and this thrust is sufficient to cause binding unless a ball or roller bearing is used.

Tapered Bearing Races Without Machining

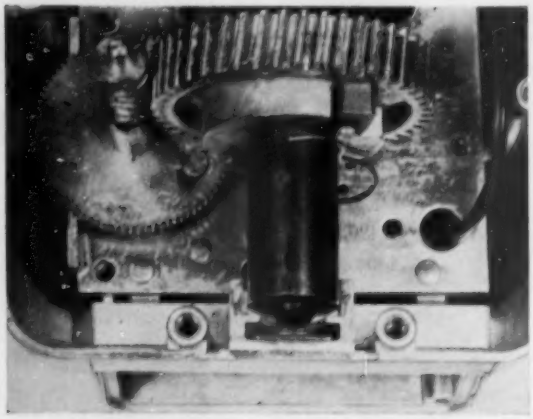
Since the speed of rotation is quite low, one revolution in 45 seconds, hardened steel races are not required. The design used is a tapered needle bearing carrying six steel needles. *This bearing displays one of the outstanding accomplishments of the die casting process. Because of the accuracy to which the castings can be made, it is adequate to cast the tapers on both bearing parts, to cast the needle grooves into the inner race and then to assemble the bearing without any subsequent machining on either the tapered races or on the needle retaining grooves.*

Some machining is necessary on the bearing unit. Three grooves must be cut, two to hold rubber weather-proofing rings and a third to hold a spring steel snap ring that retains the inner member in the outer race and bracket casting. Some holes must be drilled and tapped, though four of the seven holes are cored. In some cases, the shoulder on the inner race casting that bears on the outer race casting must be given a light facing cut. It should be noted, however, that all of the second machining operations are very inexpensive.

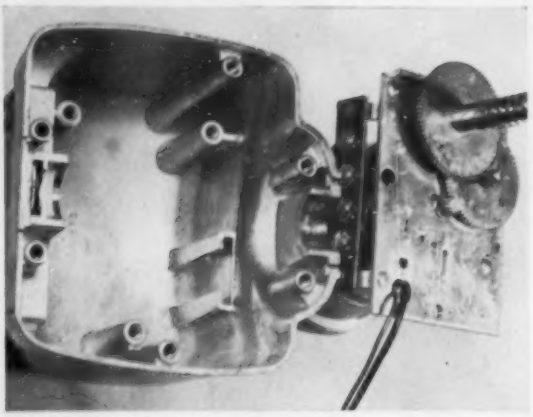
How Vertical Thrust is Met

On the rotor unit itself, a combination of severe stresses, that result from wind action and the physical weight of the antenna and mast, can be set up. One of these is a strictly vertical thrust that is the result of the weight of the antenna plus the vertical component of the bending stresses set up by wind action.

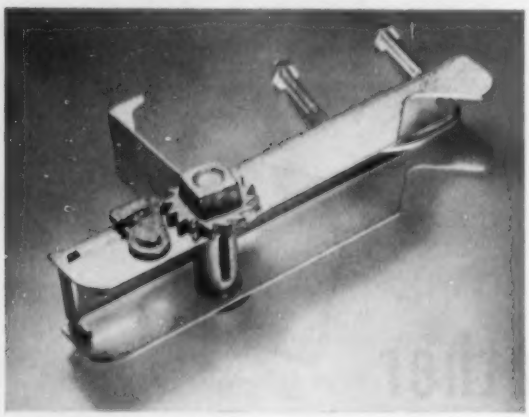
The magnitude of this vertical thrust cannot be determined accurately, but experience has shown that *the zinc die cast housing in the thickness allowable can easily handle any probable load*



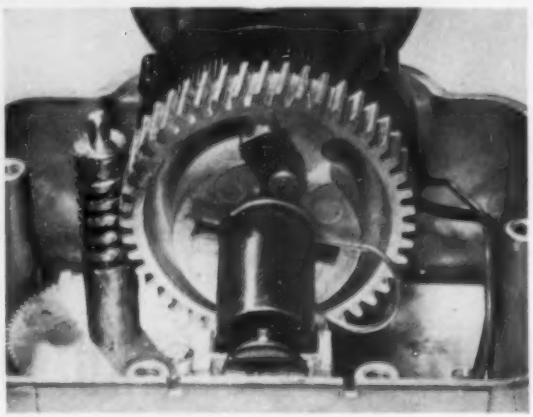
2. VERTICAL THRUST is spread over a larger area of the die casting by coring a slot and inserting a steel disc. The end of the main drive shaft rests on this hardened disc.



3. OSCILLATION caused severe stress between the steel mounting plate and the die cast housing. Enlarged bosses for over-sized machine screws give adequate anchorage to resist this stress.



4. PERMANENT MOLD CASTING provides the reel used to tighten the steel band which holds the unit to a chimney. The casting has integral ratchet and wrench grip formed in it.



5. TO PREVENT GEAR-STRIPPING, the face of the die cast zinc worm gear was increased from 5/32" to ½". Oscillation of the antenna creates a hammering action that must be resisted.

Multiple stresses have to be countered in this design . . .

if it is spread over an area of about 0.3 sq. in. The main drive shaft of the rotor is, therefore, machined with a hemispherical end which rests on a hardened and ground steel disc about 5/8" in diameter. Reference to Figure 2 shows this bearing in place and the cast-in grooves to hold the thrust plate.

Lateral thrust on this bearing and on the bearing at the top of the housing is very low so that the steel shaft can bear directly against the as-cast surface. Here another advantage of zinc is found. For slow speed rotation, zinc working against hardened steel forms an excellent bearing with the application of a little lubricant.

How Tooth Failure Has Been Overcome

The most difficult problem to overcome was that of oscillatory motion set up by wind action. With the rotor in any given position, no appreciable rotation should take place due to wind action. This is accomplished by having the pitch of the worm such that it cannot be driven by the worm gear mounted directly on the main shaft. It follows, then, that both the worm and worm gear must have tooth sections strong enough to resist any torsional stress within the elastic limit, in torsion, of the aluminum mast.

There is some play between the two gears and the result of the oscillation of the antenna is to create a hammering of the worm gear on the worm. All of this impact is resisted by one or two teeth. In addition, this hammering action causes the worm to move back and forth a slight amount. Both of these conditions have, in the past, caused trouble but have been remedied.

The worm gear in this unit is a zinc die casting. As shown here, it has a face width slightly under ½ inch. In an earlier design, this gear had a 5/32 inch face and the

Continued on page 69

RIFLE MAKER'S TARGET: LOWER PART COSTS; GRC ONE-PIECE DIE CASTING SAVES 86%!

Automatic safety catch shown at left, die cast by GRC in one piece, replaces safety catch formerly assembled from 3 separate parts. Saving 12c per unit!

GRC die casts automatic safety catch for Crosman Arms Co. for less than 2c each—formerly 14c each. 1/7th of former costs!

The three-piece assembly of an automatic safety catch for the famous Crosman gas-powered rifle cost over 14c apiece. GRC's unique one-piece die casting techniques produce a functionally identical catch at a cost of considerably less than 2c apiece.

A saving of about 86%!

These Cost Sheet facts tell their own story:

Parts A, B & C plus assembly	**$143.00 per thousand**
GRC 1-piece integral die casting	**$ 16.50 per thousand**
Saving	**$126.50 per thousand**

This is just one example of the way Gries helps industry cut costs. By precision die casting of zinc alloy tiny parts in one piece—and in one automatic operation—substantial savings in time and money are realized. Designs can be simplified, reducing or completely eliminating machining and assembly operation. The die cast Crosman catch is not only lower in cost, but is actually a superior part; one-piece casting eliminates possible loosening of assembled parts and provides greater precision. Better appearance, too, resulted from GRC's die casting design flexibility.

Gries' techniques can make parts to the most precise specifications and mass-produce them in quantities of 100,000 to many millions. Smallness is unlimited (maximum weight ½ ounce, maximum length 1¾ in.) Widest scope of design is available.

An informative Die Castings Bulletin is available. Send for your copy.

Gries Makes Extensive Line of Die Cast Zinc Alloy Threaded Fasteners

Gries produces by their exclusive die casting technique a line of high quality, low cost threaded fasteners, including wing nuts, cap nuts, wing screws, round-head thumb nuts, round-head thumb screws, rivets, which are available in a wide range of sizes. Quick delivery from stock. Special to order. All are non-ferrous, rustproof, with clean threads and bright finish. GRC mass production techniques provide lower costs. A new bulletin is now available. Write for your copy of Gries Industrial Fasteners Bulletin.

GRC "Intercast" Die Casting Offers Multiple-Parts Units with Movable Parts

In one automatic operation, Gries can "intercast" die cast tiny parts with movable elements, completely assembled, trimmed and ready to use. Elements fit precisely, yet move freely. Production of individual multiple-unit products or continuous "intercast" units is fast, economical and unique.

The "sister-hook", picture frame swivel rings, scissors, loose-leaf binder rings are 2-element movable "intercast" parts, whereas the chain shown in the photo is an example of continuous "intercasting". Send for samples and full information.

GRC Diecast Gears and Pinions in One Piece at Lower Unit Costs

The exclusive Gries die casting of gears and pinions in one operation produces one-piece assemblies faster at less cost. Cast with shafts or center holes or in combination with cams, hubs, etc., permitting wide design flexibility. Many combinations from stock dies available at no tool cost. Write for full information, samples.

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4. Special heat treatment processes give Rockwell C-48-55 hardness, yet . . . rings remain un-breakable.
5. Precision Rings are available specifically for die casting machines in various widths to suit your present and proposed plunger grooves.
6. They are engineered to let the ring take the load of sealing and maintaining pressure.

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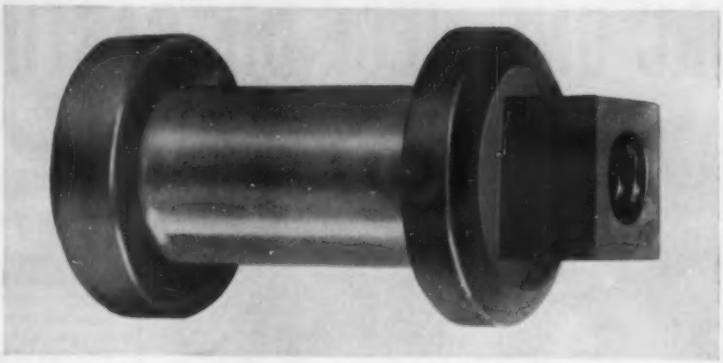
PERMANENT MOLD CASTINGS



In redesigning a component in a rubber-working machine to be cast in bronze, this company found that . . .

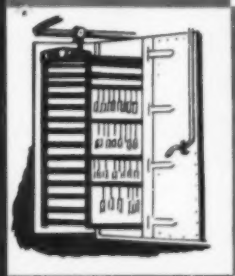
Replacing A 5-Piece Assembly Saves 85 Percent

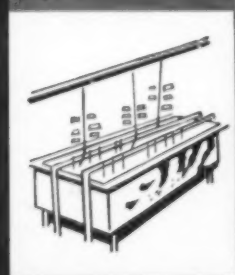
ONE part can be better than five, especially when the single piece does the same job as several pieces at a much lower cost. For example, the part pictured is one of many such inside-threaded parts which are used to deflect the steel blade of the sheeting die on thermoplastic sheet-making machines at the National Rubber Company, Akron, Ohio. For years, these parts were laboriously machined from tool steel and heat treated. Five components comprised the finished part, including two split bearing rings which were machined from brass and brazed to the part, completing the assembly at a total cost of $5.50 per part.

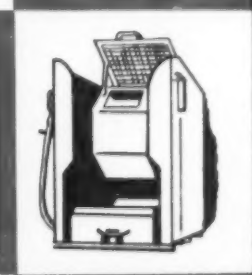
In addition to the expense involved, the steel parts showed a tendency toward freezing, or galling when the steel screw was inserted, due to the rubbing of steel on steel and the fact that the machines are run at very high temperatures for long periods of time.

The possibility of cutting production costs and improving performance prompted officials of the National Rubber Machinery Company to consult the engineering staff of Alcaloy, Inc. They received a recommendation for producing the castings in permanent molds in an aluminum-nickel-bronze alloy exhibiting very high mechanical properties — 100,000 p.s.i. tensile strength; 40,000 p.s.i. yield strength and hardness of 90-95 Rockwell "B" — and excellent heavy-duty bearing properties, which eliminated the tendency for the pieces to "freeze up" and gall. The entire part is now cast in one piece, with surfaces, as well as small diameter, finished to specification. This eliminated the five components, and the accuracy of the casting process reduced machining operations to reaming and tapping of the center hole, which also was done by the vendor.

The complete part — including reaming and tapping — is now supplied by Alcaloy at a total cost of 81 cents, a reduction in production of more than 85 percent from former costs.







PMM

Finishing Section

Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

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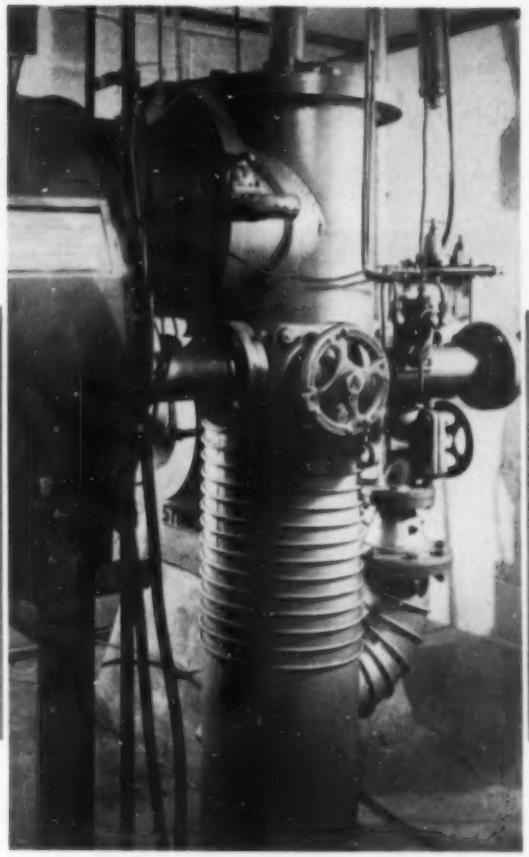


HEART of the vacuum plating installation is the vacuum pump, shown here, along with some small zinc die castings in the raw and finished condition.

By C. MATILO
Chief Engineer
Titan Valve & Mfg. Co.

Vacuum Plating: How, When, Why To Use It

VACUUM plating has come a long way in the past few years. When the process was first announced, there was a very definite feeling that the finish produced by this method would be fragile, cost would be high, and, in general, the process would be suitable only for specialty finishes.

Experience has proven that all of the early fears were without foundation. *The finish is fully as durable as any baked lacquer or enamel finish now available. When properly applied, the costs are lower than for either a plated or anodized finish, provided that little or no buffing and polishing of the parts is required to prepare the parts.* While it is certainly possible to secure specialty finishes by this process, it is by no means, limited to that application. Whenever a baked lacquer finish is adequately durable, a vacuum plated finish may be used.

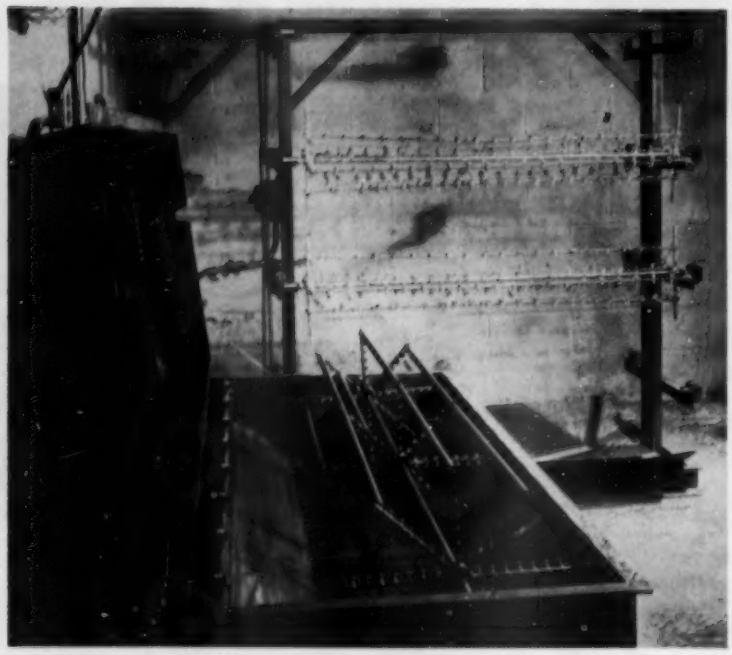
The accompanying pictures tell the vacuum plating story completely, the excellent results that can be obtained and the simplicity of the process as installed at Titan Valve & Mfg. Co.

The installation at Titan is a standard F. J. Stokes Machine Co., Model 428 vacuum metallizing unit. The tank in which actual metallizing occurs, is 36″ diameter x 60″ long. The pumping equipment consists of a Stokes Microvac pump rated at 115 cfm with an ultimate pressure below 20 microns. The pump is in series with a ring jet oil diffusion pump rated at 7300 cfm with a blank off pressure of 0.029 microns.

While the cost of vacuum plating equipment will vary somewhat, depending upon installation costs and the auxiliary equipment that must be built or purchased, a conservative estimate places the cost at less than one-half that of conventional electroplating equipment capable of handling the same number of pieces per unit time and equipped to apply the usual copper, nickel and chromium electro-plates. This comparison, how-

Continued next page

"Whenever a baked lacquer finish is durable enough, a vacuum plated finish may be used. These coatings have held up for from 120 to 140 hours in salt spray . . ."



FLOW COATING of the racked parts is a rapid method of applying both the undercoating and the covering coat of lacquer. Rack seen in the background rotates racks during air drying to prevent runs and sags in the coating.

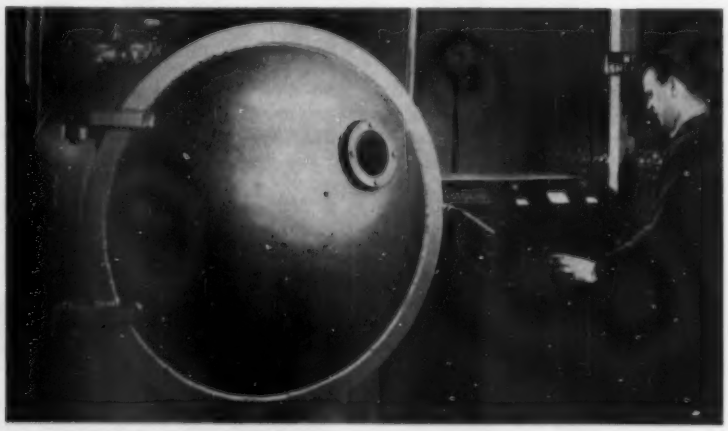
ever, is only applicable when the metallized coating is applied to simulate a chromium plated surface.

In comparing chromium plated surfaces and vacuum metallized surfaces, it is desirable also to compare resistance to atmospheric attack. Very little information is presently available, but on one set of salt spray tests we made on zinc base die castings, the vacuum metallized coating held up for from 120 to 140 hours while a conventional chromium plated surface on the same base failed in less than 100 hours.

The actual cost of vacuum metallizing is based upon single batch runs. This figure will vary somewhat depending upon the amount of labor required in racking and removal of the finished parts. Costs per piece will, of course, depend entirely on the number that can be put into the evacuation chamber per load. In the case of the small hand wheels shown in one of the illustrations *over 2000 parts can be plated per run.*

Mention has been made of the cost reductions possible with this method of finishing. On the valve knobs and indicator dials, the former finish of these zinc die castings was by "Japanning," now they are vacuum metallized to simulate chromium plating at a cost of less than half the previous costs. On another part, not die cast, where a colored anodizing process was used, the *cost per*

AS MANY AS 2000 PIECES CAN BE PLATED IN A SINGLE RUN.



COMPACT VACUUM UNIT takes up little floor space, has convenient operating control panel, and requires only 15 to 20 minutes per cycle. Evacuation of the chamber is done in two stages.

unit finished was cut from 35¢ to 18¢ for surface finishing alone.

Another advantage of this method of surface finishing, particularly for short run or job shop work, is that parts of different types of materials can be included in a single charge and coating done on all of them simultaneously. Die castings, plastics, sheet metal stampings, powdered metal parts, and, in fact, any material that can be given a baked lacquer finish can be aluminum coated in the manner described.

The application of a metallized coating and the sequence of operations are basically quite simple. The parts are cleaned and degreased then mounted on racks so that they are held rigidly in place, but also so that no part of the surface to be coated is obscured by mounting members. The racked parts are then coated with a clear lacquer by flow coating. After flow coating, the parts, still on the rack, are set into a fixture that continuously rotates them during air drying to prevent runs and sags.

Weather Conditions Have Critical Effect

Following air drying, the racked parts are baked at 300 F for about 25 minutes. This baking time is somewhat variable depending upon weather conditions and the time will have to be longer when the relative humidity is higher. This weather factor will enter several times into this process and argues emphatically for humidity control in the area where vacuum metallizing is done.

After baking, the parts are cooled and the racks then transferred to the metallizing unit. Here they are mounted in different manners. Small parts are generally set up on spiders so that they can be rotated during the metallizing operation to insure complete coverage of all surfaces. In the case of larger parts, they are generally racked around the walls of the vacuum chamber and held in fixed positions.

The actual coating of the parts with an aluminum film does not require much time. After the vacuum chamber is loaded and closed, it is evacuated to a pressure of about 150 microns with the mechanical fore pump. When this pressure is reached, the diffusion pump is cut in and the pressure reduced to between 0.2 and 0.3 microns. The time required for this pumping stage will vary, again depending upon the moisture content of the air and the absorbed layer of air and moisture on the lacquer undercoat. This latter factor will vary depending upon the particular lacquer used. Generally speaking, however, the rough pumping requires from 10 to 15 minutes and the final pumping about 5 minutes. Flashing the aluminum is fast and is done in about ½ minute.

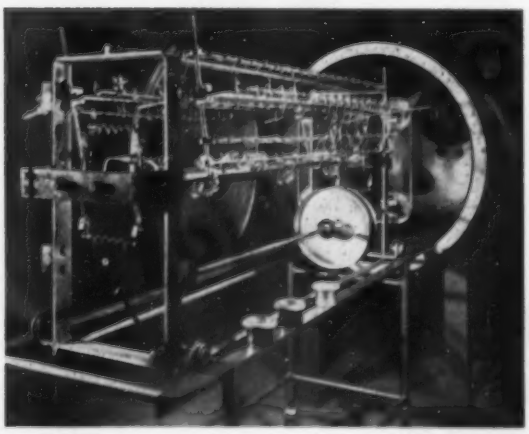
The particular aluminum used is 15 gauge 2S aluminum wire that is cut into short lengths and bent into hairpins. These are hung over the heavy tungsten filaments to heat them and cause evaporation of the metal.

Following flashing, the filaments are allowed to cool and the vacuum broken by admitting air to the chamber. When the internal pressure has reached atmospheric pressure, the vessel is opened and the coated parts removed.

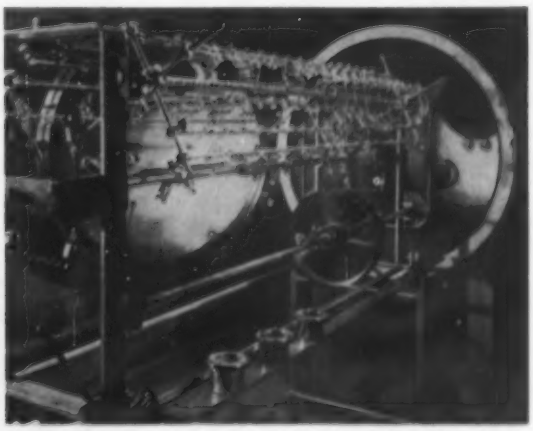
Overcoat Of Lacquer Applied By Flowcoating

The layer of aluminum is very thin, about one to one and one-half millionths of an inch, and very fragile. The racked parts are then returned to the flow coater and an overcoat of lacquer applied, air dried and baked in the same manner as the undercoat.

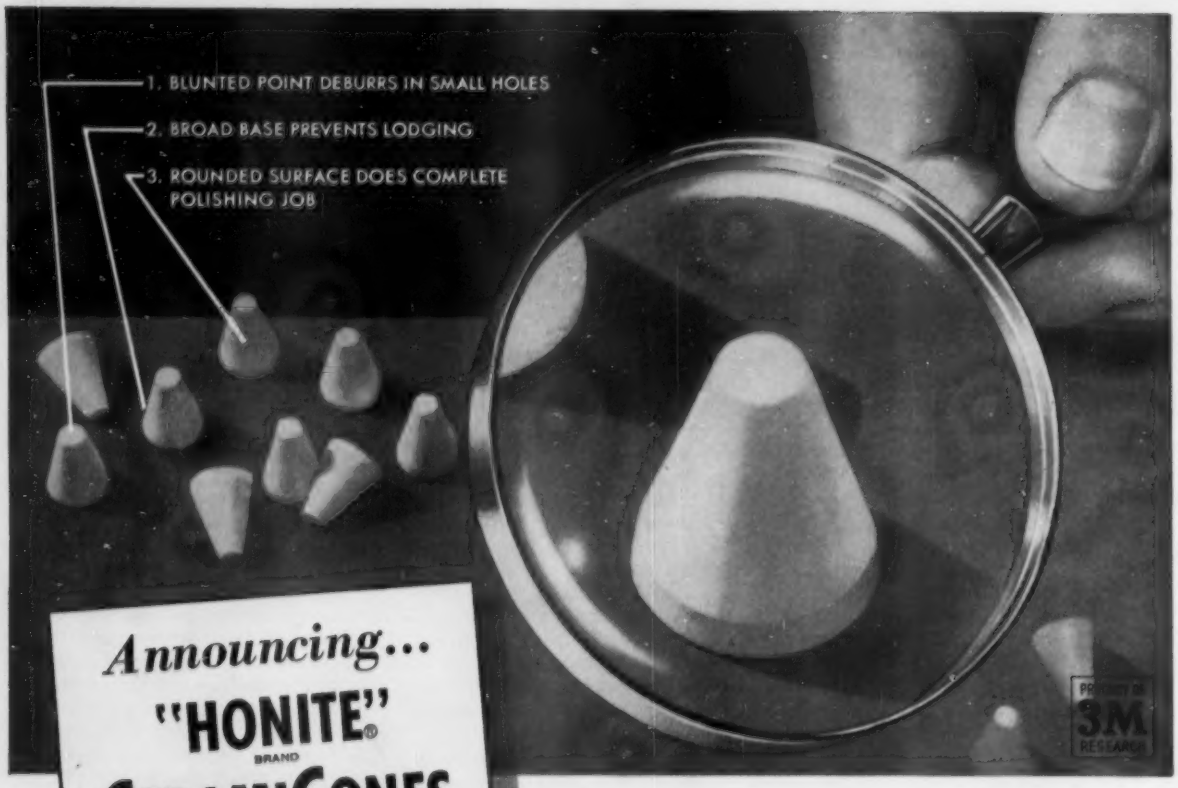
This last step is where one of the outstanding advantages of this method of surface finishing enters. By simply dyeing the lacquer with a transparent dye any color finish desired can be obtained and, at the same time, the good reflectivity of the evaporated aluminum coating retained. At present, Titan Valve is using Vernon Dy-Coat, a pre-tinted lacquer, for this purpose, but experimental work is being carried on with the use of concentrated dyes to be mixed with the clear lacquer. This should further lower costs where a col-



IN THEY GO, the raw die castings and other parts that are to be coated. Plastic parts, stampings and other types of components can be done together.



OUT THEY COME, bright and shiny, with little more than a millionth of an inch of aluminum on the surface. This needs a protective covering coat.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Look what leading manufacturers have found:

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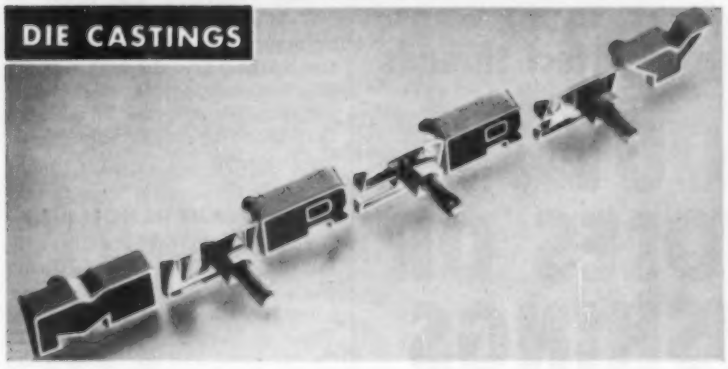
DIE CASTINGS



Drive Studs Automatically To Speed Production

SOMETIMES those simple secondary operations can "kill you" when you're figuring a close die casting job. The saving on a routine machining or assembling operation can often be the difference between profit and loss on a given casting.

The Dollin Corp., custom die casting producers in Irvington, N. J., have introduced a new piece of equipment into their production line to speed up the production of die cast letters used on the 1956 Mercury cars. This unit, a device for driving threaded studs automatically into cored holes, has eliminated a slow operation.

Previously, the die cast letters had been formed with integral studs on the rear. These were then threaded in a separate operation.

In the new system of fastening, the stud is driven into the cored hole automatically, cutting its own thread into the die cast metal as it is driven. The machine, called a Studriver, operates at very high rates of speed, driving 2500 studs per hour.

A simple, four-station fixture is used, with the operator loading and unloading at the same station. Studs are hopper fed into position in the specially-designed automatic release chuck. The chuck then drives the stud to the desired depth. It can also operate on angular holes, although the setup for attaching studs to letters calls for a straight insertion.

In a die casting plant keyed to high volume production, an operation such as this is important in keeping stocks of unfinished castings from piling up behind a bottleneck. It also has a part to play in holding piece costs down. Dollin has been producing Mercury letters for many years, but this year has introduced this stepped-up production technique.

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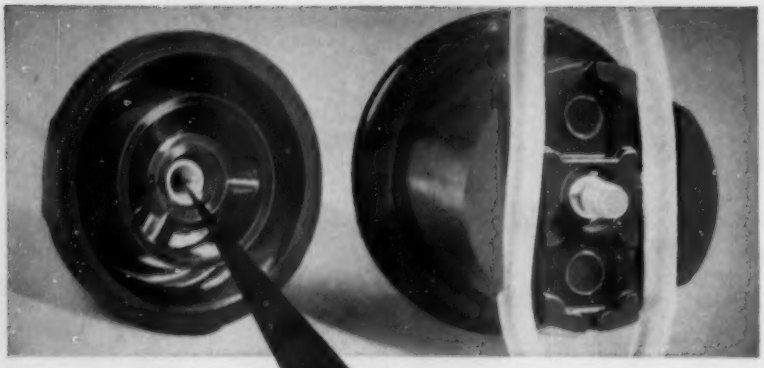

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The illustration shows a typical application. The PIP Insert in the cap of this common electrical socket provides threads strong enough to impale the two covered wires on contact prongs. The insert was pushed into a plain cored hole after molding, avoiding long cycle time required by molded-in solid bushings.

PIP Push Inserts are perfect for production line application. Either a drill press, kick press, arbor press or air piston – and a few dollars in tooling – are all you need to install perfect threads in 1,200 holes per hour.

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PRICES CUT ON LINE OF GERMANIUM RECTIFIERS

A major price reduction on all germanium rectifier models made by Hanson-Van Winkle-Munning Co. has been announced by the company. Some prices are reduced as much as 25%, depending on voltage and type of voltage control, H-VW-M reports. All price changes on germanium rectifiers were effective February 1, 1956.

This reduction will price H-VW-M germanium rectifiers lower than any model previously on the market, the company reports. In a few cases, prices for germanium rectifiers will now be no more than those for comparable selenium rectifiers.

BUILDS PLANT IN HOLLAND

Plans to construct the first colloidal graphite manufacturing plant in The Netherlands have been announced by Acheson Industries, Inc., New York, N. Y. Construction and operation of the factory, located near the harbor of Eexta, Borough of Scheemda, will be supervised by Acheson Colloids Limited, the firm's British affiliate. Estimated cost of construction is over 470,000 Dutch guilders, approximately $135,000.

OPEN DAYTON OFFICE

Reed-Prentice Corp., Worcester, Mass., subsidiary of Package Machinery Company, has announced the opening of a new sales office at 1846 Owendale Drive, Dayton 9, Ohio. Eric Brierley, sales engineer in the company's Cleveland office since 1952, will operate the Dayton office.

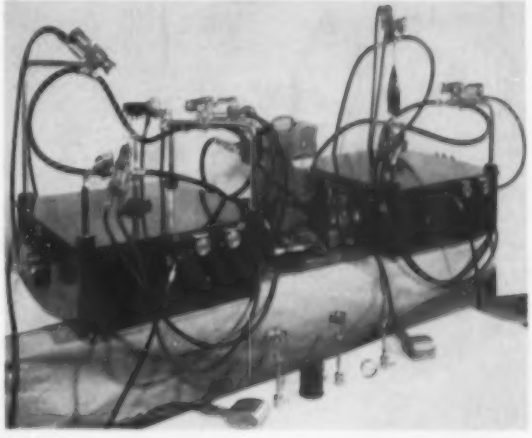
CONSOLIDATE BART UNITS

Bart Manufacturing Corp. and Bart Laboratories Co., Inc., both of Belleville, N. J., have been consolidated to form one corporation, according to an announcement from S. G. Bart, president.

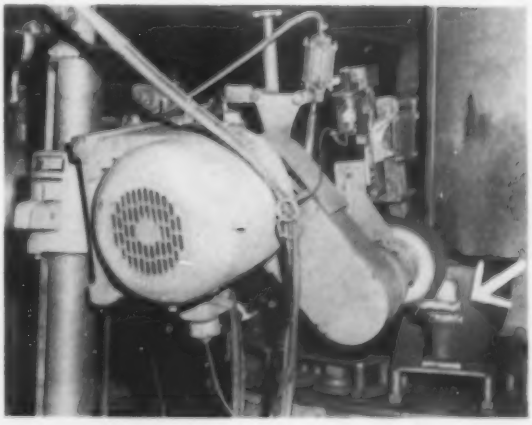
A pioneer in industrial precious metals plating and electroforming since 1912, Bart Laboratories will retain its identity as a separate division of Bart Manufacturing. Ray N. Griffin, vice president, has been appointed general manager of the division, which will now share some of the research and development facilities of the parent organization.

THE FINISHING TOUCH

PRINCIPLES OF AUTOMATION have been applied to barrel finishing in this new multiple-barrel, submerged type installation, developed by Almco Div. of Queen Stove Works, Inc. One-man operation, with preset controls, keeps continuous production going. Finishing operations that can be performed: descaling, deburring, grinding, burnishing, rinsing and rust inhibiting. An integral materials handling system built into the unit takes care of metering parts and media to a magnetic separator, through a drier. Media drops into a vertical bucket elevator which carries media overhead where it is automatically screened and separated. Special features claimed: important cost savings and uniformity of finishes.



AUTOMATIC PAINTING, using two single spindle machines and several spray guns, has stepped up the coating of these precision government components. This illustrates the fact that high production painting units are not necessarily limited to the decorative finishing of consumer goods. This installation, built by Conforming Matrix Corp., includes two single spindle units, with a Bede paint heater which makes possible the delivery of material to the spray guns at proper viscosity but with relatively high proportion of solids, permitting application of heavier paint film with a single pass of the gun. Note the fixtures, foot switches, and typical parts displayed in front of the setup.



BUFFING A COMPLICATED SHAPE can be done automatically. This electric saw housing (arrow) is passing under an automatically operated buffing head in a finishing operation at Black & Decker Mfg. Co., Towson, Md. The complicated aluminum die casting, 5" in diameter and 6½" long, includes most of the saw handle. Because of numerous projections, it seemed impossible at first to buff this casting automatically. However, in this setup using polishing heads from Acme Mfg. Co., and a ventilated buff from Hanson-Van Winkle-Munning Co., the casting is repositioned several times during buffing so that the wheels, set at different angles, can hit various surfaces of the part. Spring-balanced spindle holds the buffing wheel permitting it to ride the casting, while a ratchet mechanism automatically feeds buffing composition to the wheel.

USEFUL LITERATURE CATALOGS, MANUALS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PROCESSES

Shell Mold Castings: 154

A brochure describing the facilities and personnel has been issued by Superb Light Alloys, Inc. makers of magnesium and aluminum sand and shell molded castings.

Close Tolerance Steel Castings: 155

A new bulletin has been issued by Lebanon Steel Foundry describing the Ceramicast process for making close tolerance steel castings in ceramic molds. Quality, cost and versatility are discussed.

Powdered Metal Parts: 156

A new bulletin issued by the Powdered Metal Products Div. of Yale & Towne Mfg. Co. describes the powder metallurgy process, shows many typical parts and the saving over conventional machining methods and gives typical properties of powdered metal compacts.

Shell Mold Castings: 157

Catalog 175-A issued by The Electric Steel Foundry Co. contains 102 pages showing many of the standard and special castings in alloy and stainless steel. Typical mechanical and physical properties are tabulated.

Brass Die Castings: 158

A new four page folder prepared by the Titan Metal Mfg. Co. describes and illustrates the advantages of brass die castings.

Help in Product Development: 159

An eight page brochure has been issued by the F. J. Stokes Machine Company describing the product and process development laboratory maintained by the company for customers and prospective customers. Services include specialized help in powder metallurgy, vacuum coating, impregnating, vacuum metallurgy, etc.

Investment Castings: 160

The advantages of investment casting are explained, and design information offered in a new, informative booklet from Arwood Precision Castings. The company's plants in key industrial locations are listed.

MATERIALS AND EQUIPMENT

Metal Working Catalog: 165

A new 66-page metalworking catalog has been issued by the Carboloy Dept. of General Electric Co. The catalog gives the most effective cutting speeds for carbide tools, horsepower requirements, shank sizes, geometries of carbide tools and much other pertinent data.

Standard Mold Bases: 166

A four page brochure illustrating and describing standard mold bases that can be shipped, generally, from stock, has been issued by Detroit Mold Engineering Co.

Universal Screw Vise: 167

A new screw type vise that is specifically designed to grip the most irregular shaped as well as more standard shaped parts is described in a brochure issued by DeWilde-Jones, Inc.

Spectrographic Supplies: 168

A new catalog of spectrographic supplies has been issued by the Jarrell-Ash Co. Listed are 13 pages of special pure materials and alloy standards as well as other listings covering carbon and graphite rods and powders, preformed electrodes, etc.

Hydraulic Components: 169

A new 64-page catalog issued by Aeroquip Corp. describes and lists the company's complete line of hoses, fittings, couplings, etc.

Magnesium Applications: 170

Magnesium Topics, an external house organ of the Dow Chemical Co., is devoted to the widening application of metallic magnesium.

Fluid Power Bulletin: 171

A four page bulletin issued by Rivett Lathe & Grinder, Inc. lists the complete line of valves, cylinders and power units manufactured by the company.

Wrought Alloy Piston Rings: 172

A new brochure issued by Precision Piston Rings, Inc. describes the properties of the different materials from which their rings are made and gives factors to be determined when selecting piston rings.

Material for Pantograph Die Sinking: 173

A new aluminum filled epoxy resin for use in making master models for pantograph duplicating is described in literature that has been published by the Shell Chemical Corp.

Metals News: 174

An external house organ published by the Federated Metals Div., American Smelting & Refining Co. deals with metal applications from the ingot producer's point of view.

New Mold Material For Metal Castings: 175

Bulletin GC-2 issued by the Corning Glass Works describes their Glascast material for making highly accurate molds for casting high melting point alloys.

Foundry Coatings: 176

The use of colloidal dispersions as mold washes, stop off, anti-welding coatings and other purposes in the foundry are discussed in a new brochure, bulletin No. 425, from Acheson Colloids Co.

Continuous Cast Bearing Bronzes: 177
The advantages of continuous cast bearing bronzes, the physical properties and available sizes, are given in a new brochure from American Smelting & Refining Co.

Improved Die Casting Machines: 178
In their quarterly review, The Projectile & Engineering Co., Ltd. describes some of the new features that have been incorporated into their die casting machines and injection molding machines.

FINISHING

Shop Guide: 180
A brief, handy shopman's guide to barrel finishing has been issued by Rampe Manufacturing Co. The guide aims at removing the mystery from barrel finishing by giving size and type of stone or balls, load height, speed of rotation, amount of water, and other data to help the barrel operator.

Deburring & Chamfering: 181
A new bulletin issued by Cogsdill Tool Products, Inc. describes deburring and chamfering tools and shows many ways in which these tools can be used for fast efficient work.

Multi-Barrel Finishing: 182
In a seven page booklet, the BMT Mfg. Corp. describes a new kind of barrel finishing machine that allows the mounting of a plurality of different barrels, at varying angles, on a single rotating member.

Metal Cleaning Compound: 183
A new material to strip paint, remove phosphate undercoating and prepare a metal surface for refinishing is described in a booklet that has been issued by Oakite Products, Inc.

Burnisher & Dryer: 184
Bulletin MBD 100 has been issued by Hanson-Van Winkle-Munning Co. describing a new portable type burnishing barrel and dryer. The unit is specifically designed for handling small parts.

Continued next page

FISKE'S
Since 1870

LUBRICANTS FOR FORGING AND DIE CASTING

- Reduces Smoking
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- Better Finish
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- Less Carbon Deposit

Fiske offers two outstanding Die Lubricants for Die Casting and Forging, Upsetting, Extruding and Piercing of all metals.

No. 514 A HOT DIE LUBRICANT is a graphited product for use at temperatures to 2200° F. and over. It prevents hot metal from seizing dies or punches. Produces excellent finish with reduced smoking.

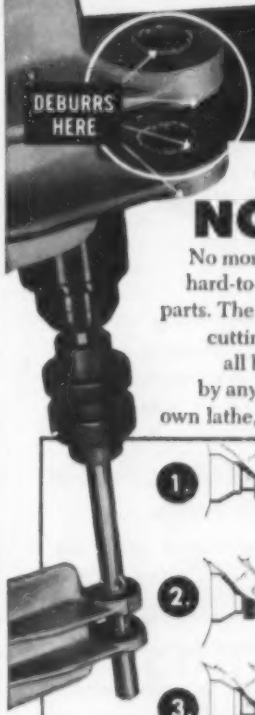
No. 231 DIE CASTING COMPOUND produces fine zinc and aluminum Die Castings. Does not fume, flash or give off offensive odors. Reduces soldering and carbon formation. Minimum gas formation results in stronger castings.

Information on each of the many Fiske Lubricating Specialties is available in bulletin form. Send for bulletins describing lubricants of interest to you.

FISKE BROTHERS REFINING CO.
Newark 5, N. J. and Toledo 5, Ohio
METAL WORKING LUBRICANTS

For more information circle No. 38 on the Reader Service Card

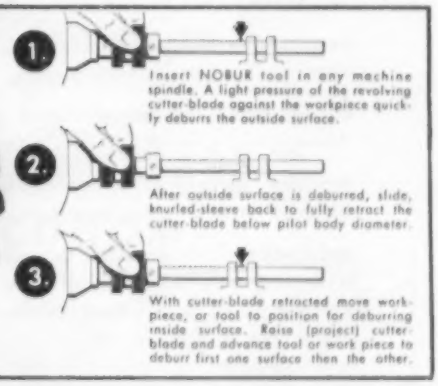
How to... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION



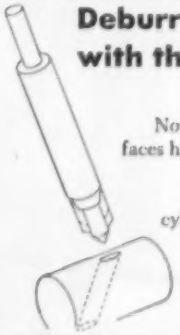
★ faster
★ better
★ easier

with the amazing
NOBUR TOOL

No more hand-finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by *machine operation*. Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.


1.
Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter-blade against the workpiece quickly deburrs the outside surface.
2.
After outside surface is deburred, slide, knurled-sleeve back to fully retract the cutter-blade below pilot body diameter.
3.
With cutter-blade retracted move workpiece, or tool to position for deburring inside surface. Raise (project) cutter-blade and advance tool or work piece to deburr first one surface then the other.

HERE'S ANOTHER PROBLEM SOLVED



Deburring Elliptical Holes with the *NEW!* ELLIPTI-BURR TOOL

Now . . . deburr openly accessible hole faces having an irregular surface like those developed when holes are drilled angularly or when drilled through cylindrical bodies. This revolutionary tool is self-piloting with a two-lipped cutter that automatically follows the hole surface geometry. Write for full data.

Write for FREE Folder
Send for all the details on Nobur Tool Products – the key to *lower* costs, *higher* production and *improved* quality on your deburring operations. WRITE TODAY!

NO-BUR TOOLS **NOBUR MANUFACTURING CO.**
6860 Farmdale Ave. No. Hollywood, California

For more information circle No. 116 on the Reader Service Card

THE MORE KNOW-HOW YOU PUT IN THE BARREL, THE MORE PROFIT YOU TAKE OUT

Useful facts gathered during Oakite's years of experience in barrel finishing are packed like #12 stones in this 10-page booklet covering such subjects as:

PRECLEANING—Good tank cleaning; Good barrel cleaning; Good rinsing saves money.

CUTTING DOWN, DEBURRING—Good solutions; Abrasive media, water and work ratios, etc.

PICKLING, DESCALING, BRIGHT DIPPING—Good solutions for steel, brass, aluminum, etc.

BURNISHING—Good solutions; Burnishing media, water and work ratios, etc.; How to overcome water hardness; How to keep barrels and media clean; How to prevent rusting, tarnishing and other corrosion.

FREE For your copy of "*May I put my head in your finishing barrel?*" just write or mail the coupon.

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Send me a FREE copy of your booklet on Barrel Finishing.

NAME_____

COMPANY_____

ADDRESS_____

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USEFUL LITERATURE—Continued

Cutting Oil for Aluminum: 185
A new information sheet has been published by Fiske Brothers Refining Co. on their CSA 2 cutting oil for aluminum.

Threaded Inserts: 186
Bulletin No. 731 from the Heli-Coil Corp. describes and illustrates threaded inserts for non-metallics and non-ferrous alloys. Design data for using these inserts is given.

Plating Rectifiers: 187
A new 12 page "Guide to Better Plating Power," has been issued by the Bart-Messing Corp., Sel-Rex Div.

Vacuum Coating: 188
The National Research Corp. has issued a new bulletin on vacuum coating of both metallic and non-metallic parts. A general description of the process is given together with examples of products that have been successfully coated.

Abrasive Rolls: 189
Bulletin F-29 prepared by American Abrasive Products, Inc. describes the use of abrasive rolls for polishing dies, die castings, permanent mold castings, deburring, etc.

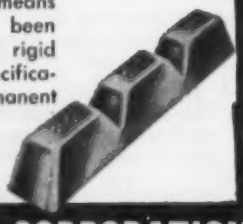
Chromium on Ferrous Surfaces: 190
The Chromalloy Corp. has available a reprint describing the results obtained in corrosion and wear resistance when a chromized surface is applied to ferrous materials.

Paint Stripping: 191
A completely revised and up-to-date booklet on stripping paint has been prepared by Oakite Products, Inc.

Threaded Inserts 192
An 11-page booklet has been issued by the Groov-Pin Corp. which fully describes and illustrates the uses of threaded inserts in non-ferrous and non-metallic parts.

When You Think of ALUMINUM BRASS & BRONZE Think of Sonken Galamba

The initials "S-G" on aluminum, brass or bronze ingot means uniform quality that has been produced to meet the most rigid chemical and physical specifications. Whether it's for permanent mold, sand or die cast, you can be confident with "S-G" ingot.



SONKEN GALAMBA CORPORATION
Riverview at 2nd Street • Kansas City 18, Kansas

For more information circle No. 117 on the Reader Service Card

DATA IN ADS
continued from page 20

110. HOW TO DEBURR elliptical holes can be learned by obtaining data sheets describing the new Elipti-Burr tool made by Nobur Mfg. Co.

111. TO CLEAN AND PROTECT metal surfaces, Neilson Chemical Co. offer the Phosteam process, described in Bulletin 55-137.

113. MAY I PUT MY HEAD in Your Finishing Barrel, is the title of a descriptive booklet from Oakite Products giving useful information on barrel finishing metal parts.

114. ROTO-FINISHING METAL PARTS is the subject of a catalog of materials, supplies and equipment from Roto-Finish Co.

115. BRIGHT PLATING PROCESS is completely described in literature from Sel-Rex Precious Metals, Inc.

116. IMPREGNATE TO ELIMINATE porosity is the theme of a brochure from Western Sealant describing their Wesco Impregnant P.E. #1.

AIR FORCE DEVELOPS HIGH TEMPERATURE ALLOYS

Investigations in the development of forged and cast alloys for high temperature applications are described in a report of Air Force research just released to industry by the Office of Technical Services, U. S. Department of Commerce.

Studies were conducted on wrought Fe-base, of the D-183 type, and both wrought and cast Co-base alloys. A heat treatable, Fe-base, austenitic alloy containing Mn and Cr was modified with B to give excellent stress-rupture results at 1200 F. The outstanding rupture properties of D-183 were obtained with a 20-per cent B addition. The optimum heat treatment for this modification is one hour at 2050 F. water quenched, plus 16 hours at 1300 F. and then air cooled. Designated R-71, this alloy has a 100-hour rupture strength of 67,000 psi at 1200 F.

Oxidation resistance was greatly improved by Al additions. A wrought Co-base alloy with good stress-rupture properties at 1600 and 1700 F. and improved oxidation resistance was developed. Composition levels giving optimum properties were determined for the cast Co-base alloys. Modifications involving B were investigated in both wrought and cast Co-base alloys.

This report, PB 111891 *Development of Wrought and Cast Alloys for High Temperature Applications*, Allegheny Ludlum Steel Corp. for Wright Air Development Center, April 1955, is available from OTS, U. S. Department of Commerce, Washington 25, price $2.50. Illustrated, it contains 93 pages.

TED NOVAK JOINS ILLINOIS PRECISE CASTING

Announcement has been made by R. J. Harvey, president of Illinois Precise Casting Co., Chicago, Ill., that T. J. (Ted) Novak has joined the company in the capacity of general manager. He was formerly associated with Austenal Laboratories and Casting Engineers, Inc.

FORM NEW DIVISION

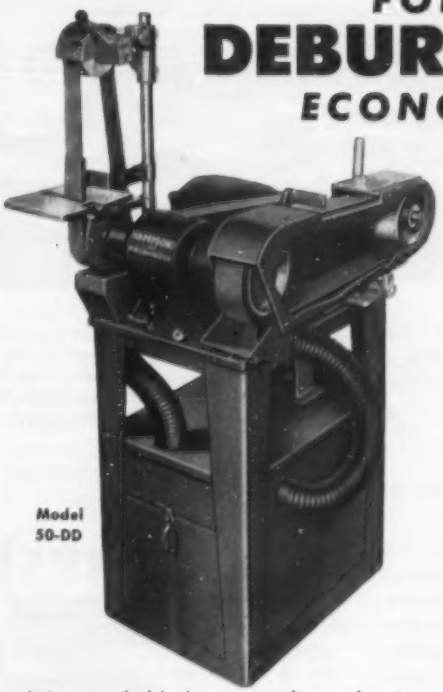
Establishment of a Refractories Division as a new operating unit of Corning Glass Works has been announced by William C. Decker, company president.

The new division will consolidate the development, manufacture and sale of conventional refractories, special high temperature refractories and Corning Glascast Mold material for precision casting of metal alloys.

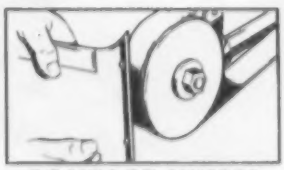
Edward C. Leibig, formerly manager of the market development department in the Technical Products Division, has been appointed general manager of the new division. R. Karl Smith will continue as manager of the Refractories Plant, J. Donald Pisula as manager of the refractories sales department.

Hammond of KALAMAZOO

FOR DEBURRING ECONOMY

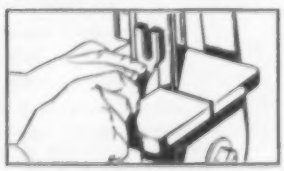


Model 50-DD



CONTACT WHEEL

IRREGULAR SHAPES



FLAT WORK

It is remarkable how soon these Abrasive Belt Machines pay for themselves in grinding, polishing and deburring.

11 combinations available with or without Duskolector.

"Clip" this ad to your letterhead. 20 page catalog will be sent at once.

Hammond Machinery Builders Inc.

1642 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

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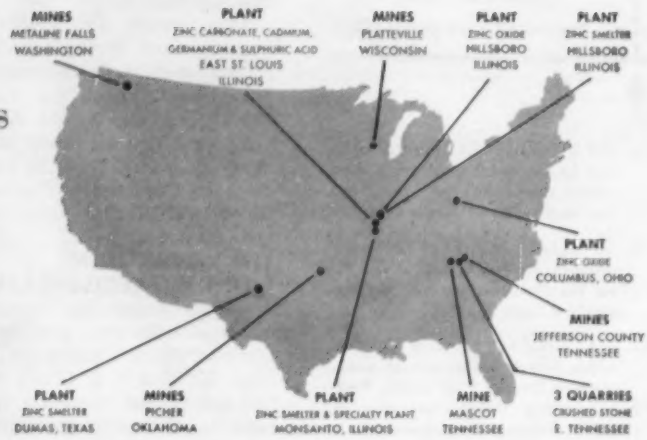
American Zinc and its products *from* A to Z



FORT SMITH, ARKANSAS, PLANT OPERATES UNDER CONTRACT WITH AMERICAN ZINC

Zinc smelter, owned and operated by the Athletic Mining and Smelting Company, produces Prime Western slab zinc for American Zinc exclusively. Plant has roasting and nodulizing equipment, as well as horizontal retort furnaces. For complete picture of American Zinc's own operations, see map above.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
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PRODUCT NEWS AND DEVELOPMENTS

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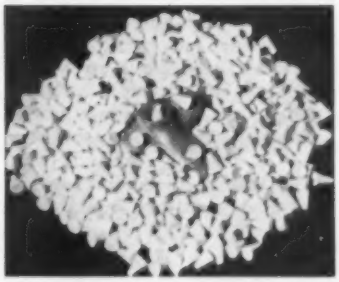
BARREL FINISHING MEDIA OF CONICAL CERAMIC SHAPES



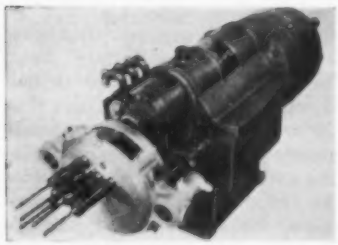
A new barrel finishing medium —conical ceramic shapes—has recently been announced. Called Ceramicones, the new media make it possible to barrel finish intricate parts which previously could not be finished in this manner because of lodging problems.

The tapered ends of the media permit access to holes for deburring, yet the broad bases prevent lodging; and the cones' resistance to wear enables them to maintain their original dimensions over a long period of time, according to the manufacturer.

The new media will remove burrs and parting lines from die castings and molded plastics without scratching the fine surface produced in molding. Danger of contamination is minimized since the ceramic material is fused under high pressure to eliminate voids and to resist the deteriorating effects of acids.

Minnesota Mining & Mfg. Co.
For more information, circle No. 205 on the Reader Service Card

AUTOMATIC DRILL UNIT HAS HIGH VERSATILITY AND ACCURACY



Announcement has been made of a new automatic drill unit that is a self contained high speed device with drill capacity ranging from wire sizes to ½" in steel.

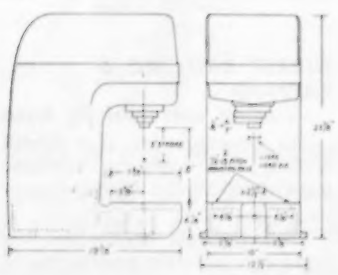
A sensitive electric relay system controls the cycle and the drill depth. A hydraulic system controls the rate of spindle feed and prevents overtravel. Drill depth can be set to less than 0.005 within the 3" maximum stroke of the unit. Feed rates are also variable from zero to the maximum the drill will stand.

A standard face plate for either single spindle drilling or multiple spindle drilling is supplied with the Unit. The single spindle assembly has a taper which will accommodate various types of drill chucks.

Units, combined with multiple heads and electrically synchronized indexing fixtures, can be mounted on a standard machine base to meet special drilling requirements. The use of standardized components keeps tooling costs low.

Ettco Tool Co., Inc.
For more information, circle No. 206 on the Reader Service Card

ONE TON PRESS FOR LOW COST, LIGHT OPERATIONS



A new one ton press that is said to be especially designed for versatility and simplicity of operation has been announced.

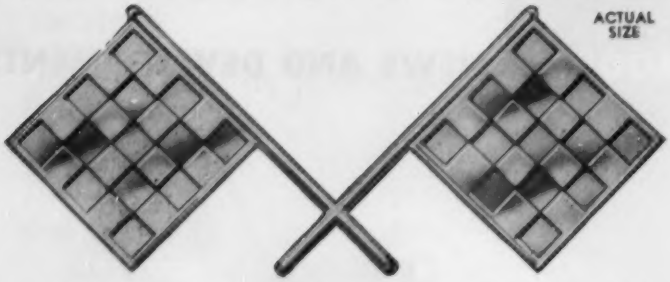
The new press has been designed, according to the manufacturer, for cutting production costs on such operations as assembling, riveting, punching, marking, trimming, pelleting, etc.

Some of the advantages noted for the press are: duplication of ram pressure every stroke, precision ram alignment, fastest cycle time of any small press, simplest to set up, ample daylight for tooling, interlocked controls.

The new hydraulic press, with ram pressure of 500 to 2,000 pounds, is electrically controlled. It weighs 225 pounds and stands only 22 inches high. It is designed to be operated individually or in a production line, with a dial table, power screw feed hop-

Continued next page

This Automobile Ornament



was die cast of Zinc at a cost of only 1½ CENTS* PER UNIT!

CAN YOU DUPLICATE PARTS OF THIS SIZE FOR SO LOW A COST ON YOUR PRESENT DIE CASTING EQUIPMENT — OR BY ANY OTHER METHOD?

* Using a 2 cavity die — 638 shots, a total of 1276 quality, hardware finish castings per hour were produced on this

LOW COST • HIGH SPEED
American Die Casting Machine

Model 60HYD

Delivered READY-TO-RUN — NOTHING ELSE TO BUY!

OVER 1100 Free Cycles Per Hour —— Shot Capacity Up To **3 Lbs.**

Speed up your PRODUCTION . . . Increase your PROFITS!

Now you can run high grade castings, up to 3 lbs., at high speeds and low operating costs. Actual tests operating 8 hours a day, 5 days a week, show total cost of gas and electricity of ONLY 17¢ PER HOUR!

Outstanding features include — all steel welded construction — automatic electric cycling at high speed — 17¾" x 17¾" die platens — 6½" die stroke — highest grade controls and valves mounted for easy maintenance and accessibility — a complete package with self contained unit.

Available in Air or Hydraulically operated plunger gooseneck type for zinc, tin or lead, or, cold chamber type for aluminum, brass and magnesium.

Users of American Die Casting Machines
AJAX DIE CASTING CO.
CHANDLER MFG. CO.
GENERAL MOTORS CORP. Rochester Prod. Div.
HELFRICH DIE CASTING CO.
NEWTON-NEW HAVEN and others

Write for FREE illustrated folder containing complete data on all models.

AMERICAN DIE CASTING MACHINERY CO.
1515 Thomas St. • Chicago 22, Ill.
PHONE: Armitage 6-3334

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continued from page 63

per, stock feed, etc.

Two operating switches, one on each side of the press, are used to start the operation. Holding both buttons will cause the ram to stay down under full pressure and tonnage as controlled by the relief valve. Releasing the buttons immediately after the ram starts will cause it to go down until it meets a resistance, then automatically reverse, return to the "up" position and remain motionless. The relief valve may be set to the desired pressure.

The electric motor is a special service motor with a thermal cut-out that must be reset manually in case of overload.

The press is a completely self contained unit that operates on either 110 or 220 volts 60 cycle current.

The Denison Engineering Co.
For more information, circle No. 207 on the Reader Service Card

MOLD AND CAVITY STEEL . . . for high surface finish

A new medium-carbon alloy steel has been announced that is designed specifically for molds and cavities where high surface finishes are desired. The new steel can be uniformly deep hardened to 300 to 350 Brinell throughout sections as large as 20" x 10". High surface hardnesses are obtained by carburizing and then oil quenching. Tables for hardening have been prepared by the manufacturer's metallurgical department.

A low heat-treating temperature is used so that there is little or no movement during quenching. The steel is available either annealed or heat treated to a hardness of 300 Brinell.

Vanadium-Alloys Steel Co.
For more information, circle No. 208 on the Reader Service Card

TURRET DRILLING & TAPPING . . . using universal jig base

The latest model of a turret drilling and tapping machine features a newly designed universal jig base.

The new base makes possible rapid and accurate positioning of work under the turret spindles,

all of which work on a common axis. Savings in handling time and down time for sharpening tools are said to be very considerable and rejects virtually eliminated.

The machine features consecutive drilling and tapping with high speeds and extreme precision on a wide range of jobs. Up to six different operations, in any desired sequence, can be completed with only one handling of the work. Individual spindle speeds, depths and reversals for tapping are preset and repeat automatically as fast as the turret is indexed.

Set-up is reported to be fast and simple, requiring no special tools.

Howe & Fant, Inc.
For more information, circle No. 209 on the Reader Service Card

CONTROLLED TORQUE TAP DRIVER

. . . for range of tap sizes

A new tap driver has recently been introduced that will accommodate a wide range of tap sizes and provide accurate torque adjustment to suit varied operating conditions.

Continued next page

how to beat the nickel shortage

Compare the present price you are paying for nickel . . . if you can get it . . . with the current price of zinc.

Zinc treated with KENVERT films, in many cases, can produce brightness and sales appeal, as well as corrosion protection, equivalent or superior to nickel.

Because zinc is a soft metal, and where hardness is a factor, an additional lacquer film may be necessary.

It will pay you to investigate KENVERT chrome sealer bright or colored films immediately. Send us detailed information on your requirements. Our laboratory is ready to consult with you or treat samples at no obligation.

KENVERT acid solutions are packaged in handy Polyethelene steel drums. Some are available in powdered form.

Distributorships available in a few territories

CONVERSION CHEMICAL CORPORATION

101 E. MAIN STREET ROCKVILLE, CONN.

Circle No. 102 on the Reader Service Card

ON EVERY POROUS CASTING
THROUGH
WASTED MATERIALS
ASSEMBLY COSTS
MACHINING TIME
PRODUCTION LAGS

WESECO Impregnant P. E. #1 will increase your profits by eliminating **all porosity** in your castings. Plants in all principal cities. Send for brochure #21.

WESTERN SEALANT COMPANY
9999 WEST JEFFERSON BOULEVARD
CULVER CITY, CALIFORNIA

Circle No. 116 on the Reader Service Card

A low price tag on a Luxury-Look' Product spells SALES!

Sel-Rex

BRIGHT PLATING PROCESSES

Selling huge quantities of goods depends on (1) goods styling (2) high speed production and (3) a "low price tag." The combination of zinc die casting and Sel-Rex BRIGHT PLATING PROCESSES is the answer to all three!

And plating with Sel-Rex BRIGHT GOLD or RHODIUM or SILVER are the most economical of all processes . . . for Sel-Rex goes further, requires no buffing, burnishing or polishing, operates at room temperature on standard equipment.

The mirror-bright finish . . . perfect, flawless, beautiful — comes right from the plating bath — requires no further finishing.

Sel-Rex Precious Metals, Inc.
229 Main Street • Belleville 9, N. J.

"The Best Friend A Design Engineer Ever Had"

Sel-Rex Precious Metals, Inc.
229 Main Street, Belleville 9, N. J.

Gentlemen: Please send me complete details on Sel-Rex BRIGHT PLATING PROCESSES.

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Company _____
Address _____
City _____ Zone _____ State _____

Circle No. 115 on the Reader Service Card

For more information circle No. 120 on the Reader Service Card

NEW!

HIGH SPEED A.B.C. DIE CASTING MACHINE

Free Cycles Over 1000 Shots Per Hour

Here's the new A·B·C high speed, low cost die casting machine which eliminates costly production of small die castings on large die casting machines. Air operated, the machine produces small non-porous lead, tin and zinc alloy precision die castings up to 1½ lbs.

The A·B·C is economical to operate and easy to set up. Its lightning production speeds makes single cavity molds practical and profitable.

STANDARD EQUIPMENT INCLUDES:

- 4 TIE BARS
- AUTOMATIC TIMING
- CALIBRATED TEMPERATURE GAS CONTROL
- GAS BURNERS
- DIE BLOCKS
- AIR REGULATOR
- FILTER
- OILER
- SAFETY SHOT INTERLOCK

Write today for engineering data and prices. Ask for bulletin A-10.

A B C

DIE CASTING MACHINE CO.

400 E. 142nd ST. · DOLTON, ILL.

These tap drivers are said to prevent or reduce tap breakage since an overriding clutch completely separates the tap from the driver. Because the driver provides positive protection when working in blind holes the speed of tapping can be increased with consequent increase in production.

By pre-setting the torque all threads on repetitive work are cut exactly the same. Should release occur before the hole is completely tapped it serves as an automatic danger signal to the operator to check for causes of trouble.

Scully-Jones & Co.
For more information, circle No. 216 on the Reader Service Card

BELT FINISHER
. . . features new wheels

Four improved models of a 2½ inch belt grinder featuring new rubber contact wheels and improved belt alignment adjustment have been introduced.

The new contact wheels enable the user to obtain a better finish in less time. They also reduce costs by increasing the life of the abrasive belts. Wheel hubs are designed for standard tires

Say, Chief! have you seen the AMAZING paint adhesion and corrosion-resisting results of those PHOSTEEM treated panels which we tested?

Such enthusiasm comes naturally to users of this Ideal NEW Process for TREATING METAL SURFACES for PAINTING—

NEILSON CHEMICAL COMPANY 25th ANNIVERSARY

FLEXIBILITY—regardless of size or shape of product to be treated, PHOSTEEM will clean and phosphatize it efficiently

Used on Tractors, Trailers, Caskets, Busses, Air Conditioners, Farm Implements and Machinery. YOU NAME IT . . . WE CAN TREAT IT!

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6563 Benson St., Detroit 7, Mich.

Allentown, Penna. Los Angeles, Cal. Windsor, Ontario

For more information circle No. 111 on the Reader Service Card

rugged enough for ball burnishing ESBEC series HD

ABRASIVE TUMBLING BARRELS

never need babying, even on the toughest jobs. You can count on uninterrupted production, long life and low upkeep. They're truly heavy-duty, with extra-rigid welded-steel drums, oversize self-aligning bearings, plus power to spare. They give higher production rates with their low loading heights, large unobstructed door openings, quick-locking safety doors, and safe accessible controls.

All ESBEC barrel finishing equipment offers practical, profit-producing features based on first-hand experience in our own, and other finishing plants. **Write for catalog today!**

EQUIPMENT SUPPLIES ABRASIVES

ESBEC **BARREL FINISHING CORP.**
21 BEECH ST., BYRAM, CONN.

BOOTH 768 ASTE SHOW

For more information circle No. 104 on the Reader Service Card

2½ in. wide and 6 in. in diameter so that standard stock tires can be used.

For easier and more accurate belt alignment, the standard back stand idler units in the new models are designed to make possible lateral adjustment of the drum. They also still have the hand knob control for belt tracking adjustment.

Delta Power Tool Div.
Rockwell Mfg. Co.
For more information, circle No. 213 on the Reader Service Card

AUTOMATIC INGOT FEEDER . . . for small die casting machines

Designed specifically to introduce ingot into the melting pot of small zinc die casting machines, a new automatic feeder is now available.

The feeder has a unique, foolproof brake arrangement, which feeds just the right amount of metal needed for proper pot temperature.

Once the feeder has been adjusted to the rate of feed desired this rate is automatically maintained from ingot to ingot.

Linotype Parts Co., Inc.
For more information, circle No. 213 on the Reader Service Card

BARREL FINISHING MEDIA . . . has controlled size, shape and grit

A new barrel finishing medium of controlled size, shape and grit abrasive is now being marketed.

The new material is said to permit wider application of barrel finishing. Special compounding of high quality, synthetic rubber and pure aluminum oxide results in media that allow abrasive

action in the most remote corners and recesses of a part without fear of chipping, splintering or cracking into odd shapes and sizes that lodge in blind or threaded holes or difficult to get at recesses.

According to the manufacturer, where surface finish is held to 32-64 micro-inches the new media will improve on this finish by from 10-30 micro-inches. Another ad-

need a finish for low cost corrosion protection or showroom sparkle?

specify IRIDITE®

Whether you're finishing non-ferrous parts for high corrosion protection, paint base, or for showroom sales appeal, you can be sure of low material and production costs and peak performance when you specify Iridite. Here's what you can do with Iridite:

- **ON ZINC AND CADMIUM** you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.
- **ON COPPER . . .** Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.
- **ON ALUMINUM** Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.
- **ON MAGNESIUM** Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

Iridite is approved under government specifications

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Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, A&P Plating Chemicals.
WEST COAST LICENSEE: L. H. Butcher Co.

For more information circle No. 101 on the Reader Service Card

vantage claimed is long life. Indications are that this new abrasive will outlast other types be from 5 to 10 times under the same operating conditions.

Speed-D-Burr Corp.
For more information, circle No. 210 on the Reader Service Card

SLIDE HONING
. . . in multiple barrel unit

Slide honing to remove burrs, scale, etc. without affecting dimensional accuracy is now possible according to the maker of a multiple barrel finishing machine.

This modern precision tumbling unit is said to provide controlled motion honing that does not change dimensions yet removes burrs, flash, tool marks, rust, paint, plating, heat treating scale and gives a finer finish and color to the parts.

In addition, rounding of corners, cleaning fillets and blending chamfers can also be done.

Since up to 25 barrels can be mounted on the single face plate, a wide variety of operations and/or parts can be handled simultaneously. Compounds for all types of finishing in these and other barrel units have also been developed.

BMT Mfg. Corp.
For more information, circle No. 211 on the Reader Service Card

ADHESIVE MATERIAL
. . . bonds metals, non-metals

Designed to bond all sorts of metals and non-metals to each other and to themselves, a new resin base adhesive is now available.

The adhesive will cure to full strength without the application of heat in about five days, but by the application of heat this time can be cut to as little as 20 min. if the materials being bonded can withstand a temperature of 300F. Lower temperatures require correspondingly longer curing time; 4 hours at 150F for example.

The non-shrinking characteristics of the adhesive allow it to be used in heavy layers to fill gaps and surface irregularities.

H. B. Fuller Co.
For more information, circle No. 217 on the Reader Service Card

DIE HANDLING UNITS
. . . standard high-lift

The availability of three standard high-lift die-handling units was recently announced.

Designed to handle dies and templates into and out of metal working presses and storage areas, the standardized units incorporate details of numerous special units of similar design developed and built in the past.

The die handlers are available in capacities of 3000, 4000 and 6000 pounds, with standard mast heights of 68 and 83 inches. They are equipped with newly-designed flip over type die-handling pins that permit pushing the die off the platform with the faces of the pin block.

Automatic Transportation Co.
For more information, circle No. 267 on the Reader Service Card

BENCH SIZE TUMBLER
. . . has one gallon barrel

A new tumbling barrel called the Mini-Tumbler has recently been announced by one of the regular barrel finishing equipment manufacturers. As the name implies, this is a small bench tumbler with one gallon volume barrel.

Despite its small size this unit is said to be sturdily built with heavy construction and parts to stand up under continuous operation on the tumbling of small parts in laboratories, foundries, plating shops, screw machine shops, etc. It will turn out work at the same speed and of the same quality as larger tumblers—and at a saving in production cost and factory space.

The Mini-Tumbler is available with either open or closed barrel. All barrels are vinyl plastic coated. Power is furnished by a 1/12 HP motor and the bench space required is only 16" by 9". Overall cabinet height is 7¼".

Rampo Manufacturing Co.
For more information, circle No. 215 on the Reader Service Card

SPEED UP PRODUCTION with DOUBLE-ACTION DRYING

Air-dry as you spin-dry with the new, improved New Holland Model 20 KREIDER CENTRIFUGAL DRYER

• Now you can *spin-dry* small parts in continuous *fresh air* in as little as 15 seconds.

Double-action drying with peak-efficiency evaporation gives smooth moisture-free surfaces . . . reduces your finishing problems by eliminating the scarring frequently responsible for costly "rejects."

Your operators will be able to boost production, cut costs way down when you install New Holland's easy-to-run Model 20 Kreider Centrifugal Dryer.

SAFER because of Mechanical and Electrical Control Features!

To unlock cover and remove basket, operator must depress foot brake, stop spinner.

Machine cannot start with open cover. Ample clearance allowed for quick loading.

To start spinner, operator must first close cover completely.

SPECIFICATIONS:
1 h. p. motor—220, 440, 550 volts—2- or 3-phase—spins 75-lb. loads at 825 r.p.m. . . . Quiet V-belt drive . . . 30-blade suction turbine draws air through spinner . . . . Arc-welded steel-plate construction . . . Heavy-gauge woven steel mesh basket . . . Weight: 490 lbs. . . . Floor space: Just under 5 sq. ft. . . . Meets N.F.C. specs. **Optional:** J.I.C. Control: Mounted on right, left side or wall. 160° supplementary heat: 2350-watt Chromalox, or steam.

Send for illustrated 4-page folder. Address Dept. PM-456
New Holland Machine Company, New Holland, Pa.

NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PA.

For more information Circle No. 112 on the Reader Service Card

ANTENNA ROTOR
continued from page 46

result of the oscillation of the antenna was to strip the teeth off the gear. Naturally, when a single tooth failed, the amplitude of the oscillation could increase so that the load on adjacent teeth was materially increased, again causing tooth failure. In some cases, this progressed to the point where all of the teeth were stripped from the gear. *With the wider face that is now used, this trouble has been completely overcome and tooth failure is never encountered.*

The movement of the worm back and forth was mentioned above. In some models of rotors, the upper bearing of the worm was originally in a cored hole in the zinc die casting. This hole is blind and the shoulder of the bronze worm was seated against the housing so that the housing took up the end thrust of the worm. Again, due to the oscillation of the antenna, the bronze shoulder was continually pounding and abrading the casting, often resulting in breakage.

To avoid this difficulty the worm is now constructed so that the end thrust in both directions is supported by the steel motor mounting plate. The upper support acts as a guide only and has an Oilite bearing pressed into the cored hole of the zinc die casting without any end thrust applied to the casting.

Die Cast Zinc Resists Torque And Impact

Below the helical worm gear, but mounted on it, a small steel member can be seen. This steel pawl, bears against a boss cast into the one housing member. This is to prevent greater than 360 degrees rotation of the antenna.

The motor used in these rotor units develops at least 6 ft. lbs. torque at the main drive shaft. This not inconsiderable torque must be absorbed by the zinc die cast stop and in addition, when the antenna is in the full north direction, the oscillation will produce a hammering action of this pawl against the stop. Here again, by proper design of the housing, it is possible to cast the stop sufficiently strong to resist any impact loading that might occur.

Two other features of these housing castings are of interest. In order to have some indication at the television set of the direction in which the antenna is oriented, a potentiometer, having a full 360 degree rotation, is mounted in the housing. The pick-up finger of the potentiometer is mounted on the rotor shaft. Then, as the antenna is turned, it is possible to measure the voltage drop across the potentiometer and calibrate a volt-meter in terms of compass directions; thus in rotating from full north to full north through a complete circle, the voltage drop will change from minimum to maximum. This, of course, accounts for the control unit having a north indication at both the zero and maximum positions on the meter scale.

The housing must be weather tight since it carries the motor and the potentiometer, both of which must be kept dry. Here again, the die casting process has proven its worth. By flanging the housing members, a sufficiently tortuous path is created so that no moisture can enter through the joint between the two halves. This leaves, as the only point where moisture can enter, the bearing at the top.

To seal this opening adequately, a rubber weather proofing ring is installed which is held in place in a groove in the upper mast holding member. In addition, an oil impregnated felt washer is placed between the housing and the mast holder. This latter washer serves both as a weather proofing member and as a source of lubrication.

Continued next page

Convert your DRILL PRESS *into an Automatic !*

SINGLE OR MULTIPLE SPINDLE

SET RAPID APPROACH to any length up to 4" + stroke with rapid cycle dial. Saves time. Ideal for jig tumbling.

SET DRILLING SPEED to material hardness with Feed Valve Dial. Adjusts to an infinite range of speeds. Increases drill and tap life.

ADJUST DRILLING DEPTH to .002 plus or minus accuracy with micrometer type Depth Dial.

MANUAL LEVER CAN BE USED ANYTIME for manual drilling or guiding in jig tumbling.

FOR DRILLING • TAPPING • REAMING • THREADING
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AIR OPERATED AND HYDRAULICALLY CONTROLLED, the General Automatic Drill Feed is a precision instrument. Carries warrantee of parts. Has operated continuously for over 10 years without replacement of parts. Hand and foot pedal release provide dual safety factor. Write for complete facts and new reduced prices to General-Pacific Corporation, 8740 Washington Blvd., Culver City, California.

GENERAL AIR OPERATED-HYDRAULIC CONTROLLED
Multi-Speed DRILL FEED

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ANTENNA ROTOR—Cont.

Alignment of the two halves of the housing could be a problem since both the worm and the potentiometer mounting must achieve their proper positions without undue trouble in assembly. Further, the two housing members should line up easily for insertion and tightening the bolts that hold them together. To secure this positive alignment, one housing half carries grooves into which small lugs on the other half fit. This quickly and accurately aligns all parts for easy assembly and helps to prevent any binding.

The brackets which carry the bolts to hold the rotor on the support mast were formerly studs screwed into the die casting and locked with nuts. This required some extra machine work and did not give as good a mounting means as might be desired. To overcome all of the troubles the casting was made with bolt holes cored through and into a square recess inside the casting so that a square headed bolt could be dropped in.

To eliminate the outside nuts that would prevent these bolts from slipping out of their sockets, after the bolts are put in place the zinc die casting is cold flowed over the heads by staking.

Before leaving these castings, one other point should be noted. When this rotor is clamped to a support mast, the oscillation of the antenna will tend to turn it on the support. To resist this twisting action and to give a more positive lock against vertical displacement, the brackets which bear against the support must have cast teeth.

The average antenna mast is from 1 to 1 and ½ inches in diameter. But, in Figure 1 it can be seen that the steel drive shaft is only about ¾ inches in diameter. Obviously, some coupling must be made between the two and this is accomplished with another die casting. This coupling is, in effect, a three jaw chuck.

The ¾" drive shaft is a cast-in insert in the base of the coupler and is held firmly in place by grooving to give proper anchorage. The cored hole for the mast is fairly sharply tapered so that when the clamp ring and steel jaws are drawn down, the mast is forced down into the coupler hole.

Since there can be no moisture leakage into the main housing, and since no very good method of excluding water from the large coupling hole can be worked out, the mast hole is made blind and is provided with a weep hole in the side for drainage. At the bottom of this blind hole, a pyramidal boss is cast that serves a dual purpose of adding rigidity near the insert and centers the bottom of the mast as it is forced into the socket; this latter function helps to maintain a good fit between the mast and the coupling socket.

One final casting should be noted. Where the support mast is fastened to a masonry chimney, or the antenna mast itself is so fastened, some sort of a clamp must be provided. The clamp made by The Radiart Corp. is shown in Figure 4 and consists of a formed steel channel and bracket that fits against the corner of the masonry. A galvanized steel or stainless steel band is passed around the chimney and the ends engaged in a permanent mold cast aluminum reel. Cast as a part of the reel is a ratchet and a wrench grip. With this arrangement, the band around the chimney is easily tightened. To release the band, it is only necessary to depress the pawl and unwind the band.

ROTO FINISH

it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

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Originators of the Roto-Finish Process

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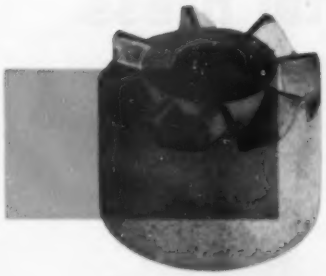
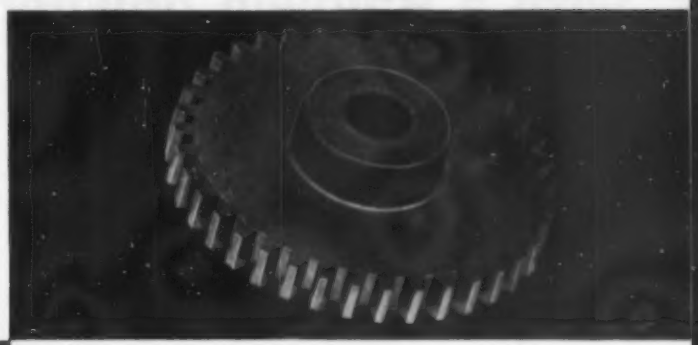
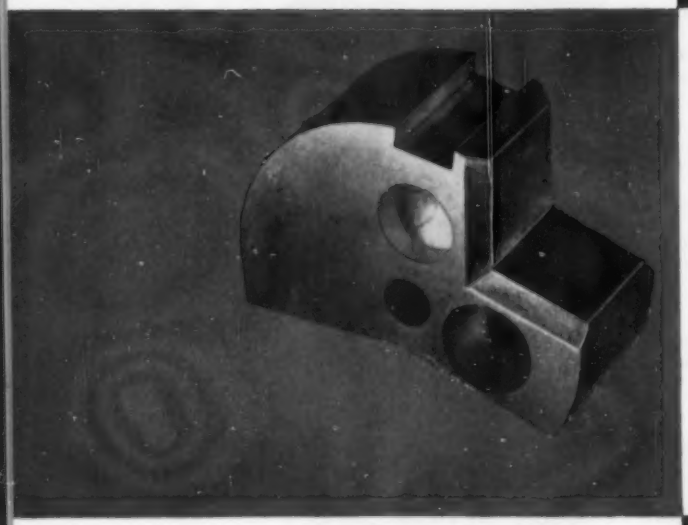
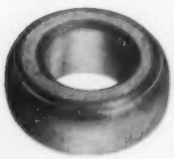


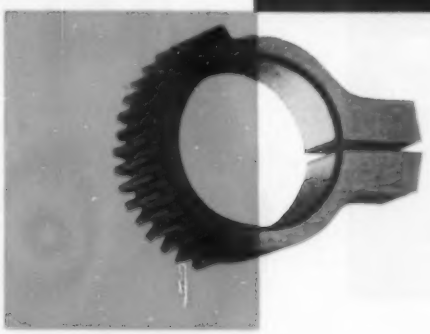




5th annual

POWDER METALLURGY DIRECTORY





section 1 REFERENCE DATA

section 2 DIRECTORY

section 3 BUYERS' GUIDE

you can produce 3 times as much with a Baldwin powder metal press

It's a proven fact. One leading manufacturer of ferrite parts is getting 3 times as many pieces per hour from his Baldwin as from any other press in the shop, and his experience is not unusual. Chances are you can do the same, whether you're compacting with iron, steel, brass, bronze or other metals.

The Baldwin is a 4-column crank-type machine, the only one of its kind on the market. Because of its extreme rigidity, and because there's no problem of tool misalignment, this press can be operated faster than any other. Additional advantages you get with a Baldwin are:

- **Closer tolerances. Length tolerances to ±.001" are common.**
- **Less finishing required.**
- **Better appearance.**
- **Less metal required.**
- **Much longer die life.**

Baldwin builds a complete line of powder metal presses, from 75 to 300 tons capacity, so whatever your requirements there's a right size for your operation. Why not find out how these modern heavy-duty presses can increase *your* production? For a copy of our new bulletin, write BLH Corporation, Philadelphia 42, Pennsylvania.

EDDYSTONE DIVISION
BALDWIN-LIMA-HAMILTON

DIVISIONS: Austin-Western • Hamilton • Lima • Eddystone • Electronics & Instrumentation • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

For more information circle No. 17 on the Reader Service Card

STANDARDS, SPECIFICATIONS AND REFERENCES FOR METAL POWDERS AND METAL POWDER PRODUCTS

Guide For Designers, Buyers And Producers Of Powdered Metal Parts

In the development of specifications for metal powders, metal powder parts and the testing of both, the Metal Powder Association has worked closely with ASTM and the various governmental departments and agencies interested. Naturally as the specifications were developed a certain amount of confusion has arisen due to the existence of different designations for the same specification. This data sheet No. 4 has been issued by the MPA as a cross reference for all presently available and accepted standards in the powder metallurgy industry.

Cross-reference for standards, specifications and other data for metal powders and metal powder products published by the American Society for Testing Materials (ASTM), Metal Powder Association (MPA), Society of Automotive Engineers (SAE) and federal agencies, including the military.

TITLE	DESIGNATION		
	MPA	ASTM	OTHER
Metal Powders			
Sampling Finished Lots of Metal Powders	1-45	B215-48	
Determination of Hydrogen Loss of Metal Powders	2-48		
Determination of Flow Rate of Metal Powders	3-45	B213-48	
Precision of Above	Supplement to 3-45		
Determination of Apparent Density of Metal Powders	4-45	B212-48	
Precision of Above	Supplement to 4-45		
Sieve Analysis of Granular Metal Powders	5-46[1]	B214-48[2]	
Determination of Insoluble Matter in Iron and Copper Powders	6-54T		
Precision of Above	Supplement to 6-54T		
Determination of Iron Content of Iron Powder	7-54T		
Precision of Above	Supplement to 7-54T		
Subsieve Analysis of Granular Metal Powders by Air Classification	12-51T	B293-54T	
Determination of Green Strength of Compacted Metal Powder Specimens	15-51T		
Aluminum Piament; Powder and Paste, for Paint			TT-A-468a
Aluminum Powder, Flaked, Grained and Atomized (for use in ammunition)			JAN-A-289
Aluminum Powder (crained or atomized) from Secondary Metal			JAN-A-512
Aluminum Powder, Superfine			JAN-A-667
Antimony, Powdered, Technical			MIL-A-10841A
Brass Powder (for sintered parts)			MIL-B-11552
Copper, Phosphor			QQ-C-571
Copper, Powder (for use in ammunition)			JAN-C-768
Iron Powder (for pyrotechnics)			MIL-I-12058
Magnesium-Aluminum Alloy, Powdered			JAN-M-454
Magnesium Powder (for use in ammunition)			JAN-M-382A
Manoanese, Powdered (for use in ammunition)			JAN-M-476A
Nickel, Powder (for use in ammunition)			JAN-A-412A
Tin, Pulverized			JAN-T-458
Titanium, Powdered			MIL-T-13405
Tungsten, Powdered			MIL-T-13827
Zinc Dust (for use in pyrotechnics)			JAN-Z-365
Zinc Dust (metallic zinc powder); Dry (paint pigment)			TT-Z-291

(1) Brass, bronze or stainless steel cloth; rotary motion of 285 ± 6 RPM; tapping action 150 per min. ± 3; tables use 250 mesh, 50 g. sample if apparent density less than 1.50 g/cc.
(2) Bronze cloth; rotary motion of 140-160 RPM; tapping action 1 per revolution; tables use 230 mesh, 50 g. sample if apparent density less than 1.50 g/cc.

METAL POWDER CROSS REFERENCE — Cont.

TITLE	DESIGNATION MPA	ASTM	OTHER
Metal Powders — Cont.			
Zirconium-Nickel Alloy Powder (for use in delay compositions)			MIL-Z-11410A
Zirconium, Powdered (for use in ammunition)			JAN-Z-399A
Metal Powders Commercially Available, Grades and Types	DS 3		
Metal Powder Bearings			
Metal Powder Sintered Bearings (oil-impregnated) Preferred Dimensional Specifications	14-51T		
Metal Powder Sintered Bearings (oil-impregnated)	16-52T	B202-55T[a]	
Sintered Metal Powder Parts (bearings and structural parts)			SAE
Bearings, Sintered, Metal Powder (oil-impregnated) Aircraft			MIL-B-5687A
Metal Powder Structural Parts			
Acceptance Tests on Structural Parts Made from Metal Powders	8-50		
Tension Test Specimens for Pressed and Sintered Metal Powders	10-50		
Determination of Bending Strength, Green Density, Hardness and Shrinkage of Compacted Sintered Metal Powder Specimens	13-51T		
Sintered Metal Powder Parts (bearings and structural parts)			SAE
Copper Infiltrated Iron Parts		B303-55T	
Sintered Metal Powder Structural Parts		B222-52	
Sintered Metal Powder Structural Parts from Bronze		B255-54T	
Sintered Metal Powder Structural Parts From Brass		B282-53T	
Brass, Sintered, Structural Parts			MIL-B-12128A
Metal Powder, Ferrous, Sintered; Structural Parts			MIL-M-13749
Electronic Cores			
Electronic Core Materials and Core Manufacturers Designations	DS 1		
Electronic Iron Core Preferred Dimensional Specifications	11-55T		
Electronic Characteristics (Relative) of Some Basic Electronic Core Materials	DS 2		
Acceptance Standards for Electronic Cores	17-54T		
Preferred Dimension Specification for Ferrite Television Deflection Yoke Core Sections	18-55T		
Electrical Contacts			
Brushes, Electrical Contact; and Carbon Plates, Electrical Contact Brush			MIL-B-3743
Others			
Terms Used in Powder Metallurgy	9-50	B243-49T	
Evaluating Micro-Structure of Apparent Porosity in Cemented Carbides		B276-52T	
Hardness Testing of Cemented Carbides		B295-54T	
Tungsten Carbide, Crystalline			MIL-T-13366

WHERE TO OBTAIN ABOVE STANDARDS AND SPECIFICATIONS

MPA, DS — Metal Powder Association, 420 Lexington Ave., New York 17, N. Y. (DS is an MPA Data Sheet and not a standard or specification).

ASTM — Amer. Soc. for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

SAE — Soc. of Automotive Engineers, 29 West 39th St., New York 18, N. Y.

JAN — Joint Army-Navy Spec., Commanding Officer, U. S. Naval Supply Depot, Scotia 2, N. Y.

TT, QQ — Federal Spec., General Service Center, GSA Region 3, 7th & D Sts., S. W., Washington 25, D. C., or local GSA Region.

MIL — Military Spec., Dept. of the Army, New York Ordnance District, 180 Varick St., New York 14, N. Y., att: Drawings & Spec. Section, or local Ordnance District.

Exceptions: MIL-I-12058, MIL-A-10841A, MIL-T-13405 — New York Chemical Procurement District, U. S. Army, 180 Varick St., New York 14, N. Y., Att: Administrative Service Div., or local Procurement District.

MIL-B-3743 — Corps of Engineers, U. S. Army, N. Y. District, 80 Lafayette St., New York 13, N. Y., or local Ordnance District Office.

[a] Contains additional explanatory notes and tables.

POWDER METALLURGY NOMENCLATURE

Common understanding of the basic terms is a prerequisite to any discussion of a technical subject. To fulfill this need, the Metal Powder Association, in its MPA Standard 9-50T, dated May 1950, has offered definitions of the terms used in powder metallurgy. This is published below.

Acicular Powder.—Needle shaped particles.

Air Classification.—The separation of powder into particle size fractions by means of an air stream of controlled velocity.

Alloy Powder.—A powder all particles of which are composed of the same alloy of two or more metals.

Apparent Density.—The weight of a unit volume of powder, usually expressed as grams per cubic centimeter, determined by a specified method.

Arborescent Powder.—See Dendritic Powder.

Atomization.—The dispersion of a molten metal into particles by a rapidly moving gas or liquid stream.

Binder.—A cementing medium; either a material added to the powder to increase the green strength of the compact, and which is expelled during sintering; or a material (usually of relatively low melting point) added to a powder mixture for the specific purpose of cementing together powder particles which alone would not sinter into a strong body.

Blank.—A pressed, presintered or fully sintered compact, usually in the unfinished condition, requiring cutting, machining, or some other operation to give it its final shape.

Blending.—The thorough intermingling of powders of the same nominal composition (not to be confused with mixing).

Bridging.—The formation of arched cavities in a powder mass.

Briquet.—See Compact.

Bulk Density.—Synonymous with Apparent Density (U.S.), and Loading Weight (British).

Bumping Down.—The consolidation of a mass of metal powder by vibration before the pressing operation (British).

Cake.—A coalesced mass of unpressed metal powder.

Carbonyl Powder.—A metal powder prepared by the thermal decomposition of a metal carbonyl.

Chemical Deposition.—The precipitation of one metal from a solution of its salts by the addition of another metal or reagent to the solution.

Classification.—Separation of a powder into fractions according to particle size.

Coining.—The final pressing of a sintered compact to obtain a definite surface configuration (not to be confused with repressing or sizing).

Cold Pressing.—The forming of a compact at room temperature.

Cold Welding.—Cohesion between two surfaces of metal, generally under the influence of externally applied pressure at room temperature.

Compact.—An object produced by the compression of metal powder, generally while confined in a die, with or without the inclusion of nonmetallic constituents. Synonymous with Briquet.

Composite Compact.—A metal powder compact consisting of two or more adhering layers of different metals or alloys with each layer retaining its original identity.

Compound Compact.—A metal powder compact consisting of mixed metals, the particles of which are joined by pressing or sintering or both, with each metal particle retaining substantially its original composition.

Compressibility.—A density ratio determined under definite testing conditions.

Compression Ratio.—The ratio of the volume of the loose powder to the volume of the compact made from it.

Continuous Sintering.—Presintering or sintering, in such manner that the objects are advanced through the furnace at a fixed rate by manual or mechanical means. Synonymous with Stoking.

Core Rod.—A member of a die used to produce a hole in a compact.

Cored Bar.—A compact of bar shape heated by its own electrical resistance to a temperature high enough to melt its interior.

Cut.—See Fraction.

Dendritic Powder.—Particles, usually of electrolytic origin, having the typical pine tree structure. Synonymous with Arborescent Powder.

Density Ratio.—The ratio of the determined density of a compact to the absolute density of metal of the same composition, usually expressed as a percentage.

Die.—The part or parts making up the confining form in which a powder is pressed. The parts of the die may be some or all of the following: die body, punches, and core rods. Synonymous with Mold

Die Body.—The stationary or fixed part of a die.

Die Insert.—A removable liner or part of a die body or punch.

Die Lubricant.—A lubricant applied to the walls of the die and punches to facilitate the pressing and ejection of the compact.

Die Set.—The parts of a press that hold and locate the die in proper relation to the punches.

Disintegration.—The reduction of massive material to powder.

Electrolytic Powder.—Powder produced by electrolytic deposition, or by the pulverization of an electrodeposit.

Exudation.—The action by which all or a portion of the low melting constituent of a compact is forced to the surface during sintering. Synonymous with Sweating.

Fines.—The portion of a powder composed of particles which are smaller than a specified size, currently less than 44 microns. See also Superfines.

Flake Powder.—Flat or scale-like particles whose thickness is small compared with the other dimensions.

Flow Rate.—The time required for a powder sample of standard weight to flow through an orifice in a standard instrument according to a specified procedure.

Fraction.—That portion of a powder sample which lies between two stated particle sizes. Synonymous with Cut.

Fritting.—Sintering in the presence of a liquid phase. (A term seldom used in the United States.)

Gas Classification.—The separation of powder into particle size fractions by means of a gas stream of controlled velocity.

Graining (British).—See Granulation.

Granular Powder.—Particles having approximately equidimensional nonspherical shapes.

Granulation.—The production of coarse metal particles by pouring the molten metal through a screen into water, or by violent agitation of the molten metal while solidifying.

Green.—Unsintered (not sintered); for example: green compact, green density, green strength.

Growth.—An increase in dimensions of a compact during sintering (converse of shrinkage).

Hot Pressing.—The simultaneous heating and molding of a compact.

Hydrogen Loss.—The loss in weight of metal powder or of a compact caused by heating a representative sample for a specified time and temperature in a purified hydrogen atmosphere — broadly a measure of the oxygen content of the sample, when applied to materials containing only such oxides as are reducible with hydrogen and no hydride forming element.

Continued next page

Impregnation.—A process of filling the pores of a sintered compact, usually with a lubricant; also a process of embedding particles of a nonmetallic substance in a powder metal matrix, as in diamond impregnated tools; also a process of filling the pores of a sintered, or unsintered, compact with a metal or alloy of lower melting point.

Intercommunicating Porosity.—That type of porosity in a sintered compact in which the pores are connected so that a fluid may pass from one to the other completely through the compact.

Irregular Powder.—Particles lacking symmetry.

Loading.—The filling of the die cavity with powder.

Lower Punch.—The lower member of a die which forms the bottom of the die cavity. It may or may not move in relation to the die.

Lubricating.—Mixing with, or incorporating in, a powder, some agent to facilitate pressing and ejecting the compact from the die body; applying a lubricant to the die walls and punch surfaces.

Matrix Metal.—The continuous phase of a polyphase alloy or mechanical mixture; the physically continuous metallic constituent in which separate particles of another constituent are embedded.

Milling.—The mechanical treatment of metal powder, or metal powder mixtures, as in a ball mill, to alter the size or shape of the individual particles, or to coat one component of the mixture with another.

Minus Sieve.—The portion of a powder sample which passes through a standard sieve of specified number. (See Plus Sieve.)

Mixing.—The thorough intermingling of powders of two or more materials.

Mold.—See Die.

Molding.—The pressing of powder to form a compact.

Needles.—Elongated rod-like particles.

Nodular Powder.—Irregular particles having knotted, rounded, or similar shapes.

Oversize Powder.— Particles coarser than the maximum permitted by a given particle size specification.

Packing Material.—Any material in which compacts are embedded during the presintering or sintering operation.

Particle Size.—The controlling lineal dimension of an individual particle as determined by analysis with sieves or other suitable means.

Particle Size Distribution.—The percentage by weight, or by number, of each fraction into which a powder sample has been classified with respect to sieve number or microns. (Preferred usage: "particle size distribution by weight" or "particle size distribution by frequency.")

Permeability.—A property measure as the rate of passage of a liquid or gas through a compact; measured under specified conditions.

Plates.— Flat particles of metal powder having considerable thickness.

Plus Sieve.—The portion of a powder sample retained on a standard sieve of specified number. (See Minus Sieve.)

Pore-Forming Material.—A substance included in a powder mixture which volatilizes during sintering and thereby produces a desired kind and degree of porosity in the finished compact.

Powder.—An aggregate of discrete particles that are usually within the size range 1 to 1000 microns.

Powder Flow Meter.—An instrument for measuring the rate of flow of a powder by a specified procedure.

Powder Lubricant.—An agent mixed or incorporated in a powder to facilitate the pressing and ejecting of the compact.

Powder Metallurgy.—The arts of producing metal powder and of the utilization of metal powders for the production of massive materials and shaped objects.

Preforming.—The initial pressing of a metal powder to form a compact which is subjected to a subsequent pressing operation other than coining or sizing. Also, the preliminary shaping of a refractory metal compact after presintering and before the final sintering.

Presintering.—The heating of a compact at a temperature below the normal final sintering temperature, usually to increase the ease of handling or shaping the compact, or to remove a lubricant or binder prior to sintering.

Pressed Bar.—A compact in the form of a bar; a green compact.

Pressed Density.—The weight per unit volume of an unsintered compact. Synonym: Green Density.

Pressing Crack.—See Slip Crack.

Puffed Compact.—A compact expanded by internal gas pressure.

Pulverization.—The reduction of metal powder by mechanical means; a specific type of disintegration.

Punch.—Part of a die assembly which is used to transmit pressure to the powder in the die cavity.

Rate-of-Oil-Flow.—The rate at which a specified oil will pass through a sintered porous compact under specified test conditions.

Repressing.—The application of pressure to a previously pressed and sintered compact, usually for the purpose of improving some physical property.

Roll Compacting.—The progressive compacting of metal powders by the use of a rolling mill.

Rolled Compact.—A compact made by passing metal powder continuously through a rolling mill so as to form relatively long sheets of pressed material.

Rotary Press.—A machine fitted with a rotating table carrying multiple dies in which a material is pressed.

Screen Analysis.—See Sieve Analysis.

Segment Die.—A die made of parts which can be separated for the ready removal of the compact. Synonymous with Split Die.

Shrinkage.—A decrease in dimensions of a compact which may occur during sintering (converse of growth).

Sieve Analysis.—Particle size distribution; usually expressed as the weight percentage retained upon each of a series of standard sieves of decreasing size and the percentage passed by the finest sieve.

Sieve Classification.—The separation of powder into particle size ranges by the use of a series of graded sieves.

Sieve Fraction.—That portion of a powder sample which passes through a standard sieve of specified number and is retained by some finer sieve of specified number.

Sintering.—The bonding of adjacent surfaces of particles in a mass of powder, or a compact, by heating.

Sizing.—A final pressing of a sintered compact to secure desired size.

Slip Crack.—A rupture in the pressed compact caused by the mass slippage of a part of the compact. Synonymous with Pressing Crack.

Specific Surface.—The surface area of one gram of powder, usually expressed in square centimeters.

Spherical Powder.—Globular shaped particles.

Split Die.—See Segment Die.

Spongy.—A porous condition in metal powder particles usually observed in reduced oxides.

Stoking.—See Continuous Sintering.

Stripper Punch.—A punch, which in addition to forming the top or bottom of the die cavity, later moves further into the die to eject the compact.

Subsieve Fraction.—Particles all of which will pass through a 44 micron (No. 325) standard sieve.

Superfines.—The portion of a powder composed of particles which are smaller than a specified size, currently less than 10 microns.

Sweating.—See Exudation.

Tap Density.—The apparent density of a powder obtained when the receptacle is tapped or vibrated during loading under specified conditions.

Upper Punch.—The member of a die assembly which moves downward into the die cavity to transmit pressure to the powder contained in the die cavity.

Warpage.— Distortion in a compact during sintering.

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POWDER METALLURGY DIRECTORY

SECTION 2
PRODUCT SOURCES

For addresses of companies listed, see Section 3, page 107.

COMPONENTS FABRICATORS

BEARINGS—COPPER BASE

Allied Products Corp.
Powdered Metal Parts Div.
American Powdered Metals, Inc.
American Sinteel Corp.
Asco Sintering Co.
Bassick Co.
Bound Brook Oil-less Bearing Co.
Brockway Pressed Metals, Inc.
Bronz-Aloy Corp.
Picco Industries Div.
Bunting Brass & Bronze Co., The
Ceromet, Inc.
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Compacted Metals Corp.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Engineered Plastics, Inc.
American Sinterings Div.
Ferro Powdered Metals
Ford Motor Co.
General Powdered Metal Products, Inc.
General Sintering Corp.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Johnson Bronze Co.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Lux Clock Mfg. Co.
Merriman Brothers, Inc.
Metal Powder Products, Inc.
Moraine Products Div.
General Motors Corp.
National Molded Products, Inc.
Pacific Sintered Metals
Parker White-Metal Co.
Picco, Inc.
Powder Metal Products, Inc.
Powdercraft Corp.
Precision Metal Products Co.
Presmet Corp., The
Reese Metal Products Corp.
St. Marys Carbon Co.
Sintered Metals, Inc.
Standard Automation Products
Superior Carbon Products, Inc.
Symmco, Inc.
Wakefield Bearing Corp.
Western Sintering Co.
Wicks Corp., The
The United States Graphite Co.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

BEARINGS—IRON BASE

Allied Products Corp.
Powdered Metal Parts Div.
American Powdered Metals, Inc.
American Sinteel Corp.
Asco Sintering Co.
Bassick Co.
Bound Brook Oil-less Bearing Co.
Brockway Pressed Metals, Inc.
Bronz-Aloy Corp.
Picco Industries Div.
Bunting Brass & Bronze Co., The
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Compacted Metals Corp.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Engineered Plastics, Inc.
American Sinterings Div.
Ferro Powdered Metals
Ford Motor Co.
General Powdered Metal Products, Inc.
General Sintering Corp.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Johnson Bronze Co.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Merriman Brothers, Inc.
Metal Powder Products, Inc.
Moraine Products Div.
General Motors Corp.
National Molded Products, Inc.
Pacific Sintered Metals
Parker White-Metal Co.
Picco, Inc.
Powder Metal Products, Inc.
Powdercraft Corp.
Precision Metal Products Co.
Presmet Corp., The
Reese Metal Products Corp.
St. Marys Carbon Co.
Sintered Metals, Inc.
Standard Automation Products
Superior Carbon Products, Inc.
Symmco, Inc.
Wakefield Bearing Corp.
Western Sintering Co.
Wicks Corp., The
The United States Graphite Co. Div.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

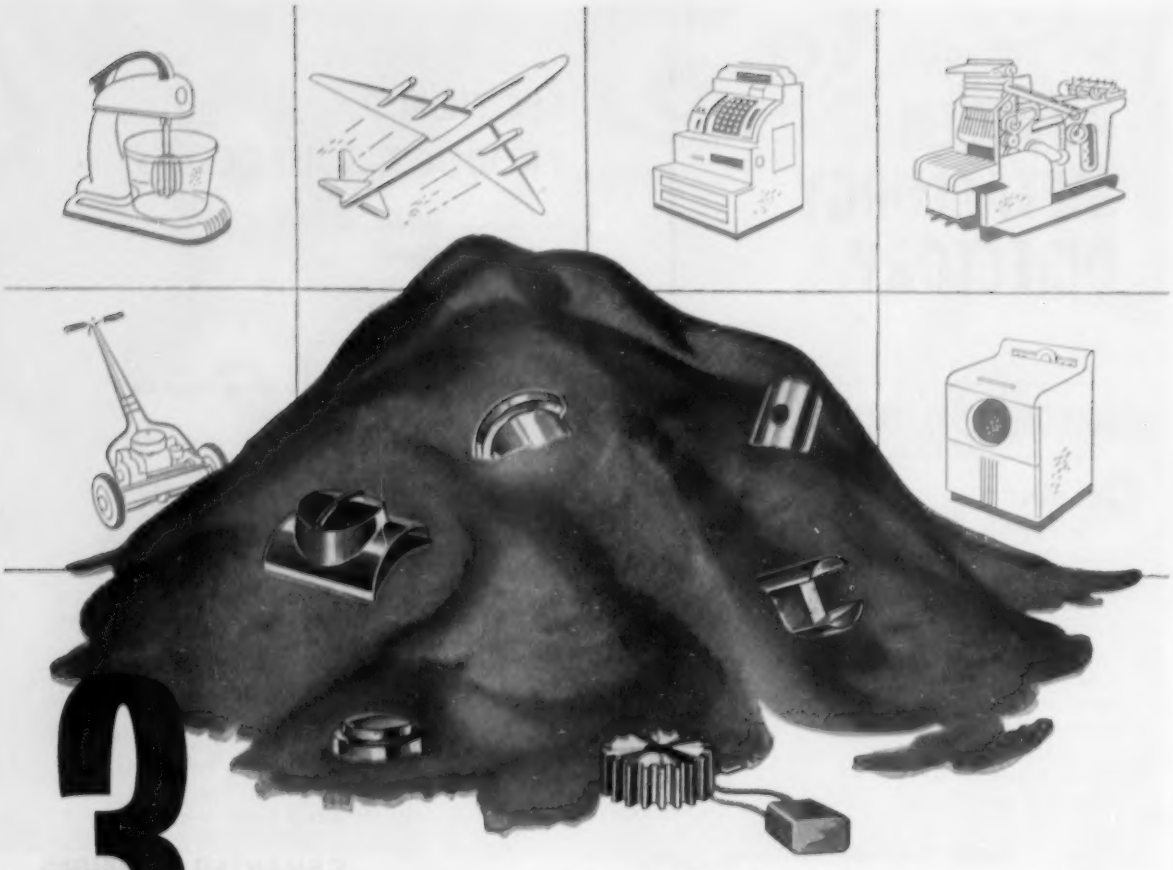
CEMENTED CARBIDES

All Types
Adamas Carbide Corp.
Firth Sterling, Inc.
General Electric Co.
Carboloy Dept.
Kennametal, Inc.
Shieldalloy Corp.
Sintercast Corp. of America
Welded Carbide Tool Co., Inc.
Wesson Metal Corp.

CONTACT MATERIALS

Pure Metals
(Platinum, Silver Etc.)
Fansteel Metallurgical Corp.
Keystone Carbon Co.
P. R. Mallory & Co., Inc.
Metroloy Co.
Rossborough Supply Co.
St. Marys Carbon Co.
Sintered Metals, Inc.
Superior Carbon Products, Inc.
H. A. Wilson Co., The

Tungsten Copper,
Tungsten Silver, Etc.
Fansteel Metallurgical Corp.
Keystone Carbon Co.
P. R. Mallory & Co., Inc.
St. Marys Carbon Co.
Sintercast Corp. of America
H. A. Wilson Co., The



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CORES— HIGH FREQUENCY

Arnold Engineering Co., The
Bunting Brass & Bronze Co., The
Henry L. Crowley & Co., Inc.
Ferroxcube Corp. of America
Indar Corp.
Kwikset Powdered Metal Products
Magnetic Core Corp.
Micrometals
National Moldite Co.
Pyroferric Co., Inc.
Quality Components, Inc.
Radio Cores, Inc.
Stackpole Carbon Co.
Yale & Towne Mfg. Co.
Powder Products Div.

CORES— LOW FREQUENCY

Arnold Engineering Co., The
Bunting Brass & Bronze Co., The
Henry L. Crowley & Co., Inc.
Ferroxcube Corp. of America
Indar Corp.
Kwikset Powdered Metal Products
Magnetic Core Corp.
Micrometals
National Moldite Co.
Pyroferric Co., Inc.
Quality Components, Inc.
Stackpole Carbon Co.

ELECTRICAL COMPONENTS

Collector Rings

American Sinteel Corp.
Asco Sintering Co.
Bunting Brass & Bronze Co., The
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Ferro Powdered Metals
Kwikset Powdered Metal Products
Metal Powder Products, Inc.
Parker White-Metal Co.
Powdercraft Corp.
Sintered Metals, Inc.

Commutator Segments

American Sinteel Corp.
Asco Sintering Co.
Bunting Brass & Bronze Co., The
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Eberhart Steel Products
Powdered Metals Div.
Kwikset Powdered Metal Products
Sintered Metals, Inc.

Pole Pieces

Allied Products Corp.
Powdered Metal Parts Div.
American Powdered Metals, Inc.
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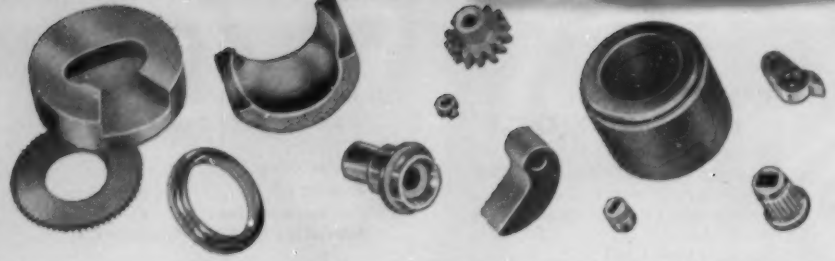
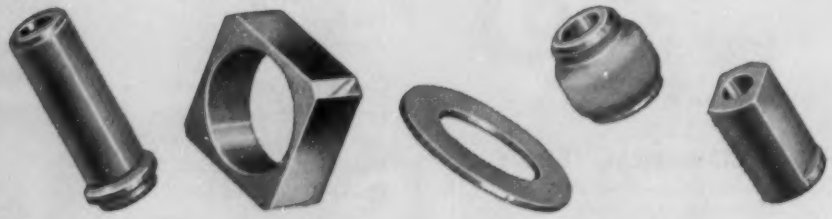
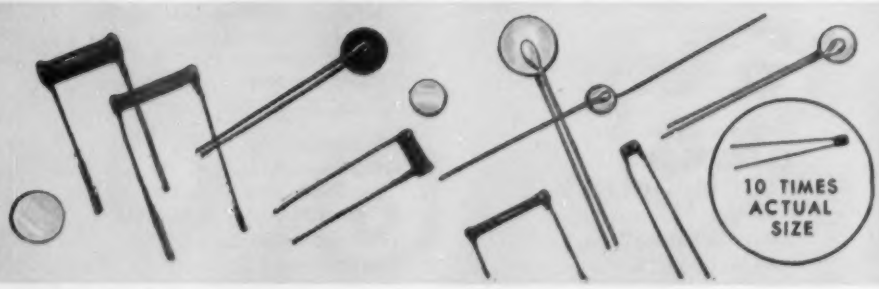


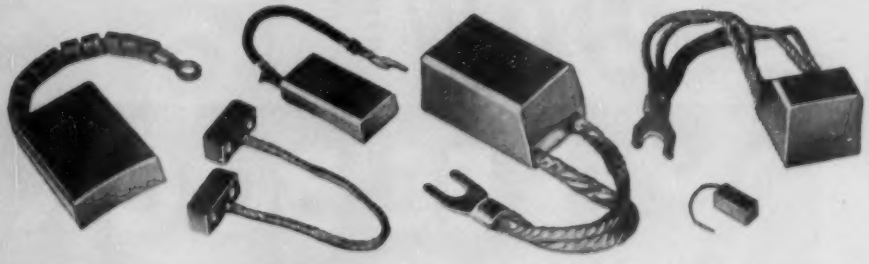
SELF LUBRICATING BEARINGS



NTC RESISTORS (THERMISTORS)



CARBON AND METAL GRAPHITE BRUSHES



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Four areas of manufacture and sales—*one* basic production technique! We specialize in molding and sintering many different powdered materials—carbon, graphite, metals and metal oxides—for a great variety of end uses. We apply the experience gained in one field to the advantage of all. • Our centralized research and engineering development helps lower costs and improve the performance of each Keystone product. We invite you to benefit by our pioneering—our quarter-century of broad experience—our special manufacturing resources. Let us consult on your needs, and quote on your requirements!

For more information circle No. 56 on the Reader Service Card

Keystone CARBON COMPANY
ST. MARYS, PA.

Leadership in Powder Metallurgy Research, Design, Manufacture since 1927

15 TONS of UNIFORMITY

Yes! PLAST-IRON Powders are blended in truck load units

- **Provide trouble-free performance**
- **Reduce press adjustments**
- **Eliminate your mixing operations**
- **Cut your costs**

Plast-Iron B-261 blended with graphite and stearate ready for use will reduce your operating costs. New Data Sheet shows important savings. Write 3456A Bridge Street Johnstown, Pa.

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District Offices
Chicago — Johnstown — Los Angeles

PLASTIC METALS

Division of
National-U.S. Radiator Corporation

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Rotor Segments

American Sinteel Corp.
Asco Sintering Co.
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Eberhart Steel Products
Powdered Metals Div.
Ferro Powdered Metals
Kwikset Powdered Metal Products
Powdercraft Corp.
Sintered Metals, Inc.

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American Brake Shoe Co.
American Sinteel Corp.
Chrysler Corp.
Amplex Div.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Firth Sterling, Inc.
General Metals Powder Co.
Moraine Products Div.
General Motors Corp.
National Molded Products, Inc.
Powdercraft Corp.
Raybestos-Manhattan, Inc.
Sintered Metals, Inc.
Wakefield Bearing Corp.
S. K. Wellman Co., The

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Hard—Alnico Type

Arnold Engineering Co., The
Ferroxcube Corp. of America
General Electric Co.
Carboloy Dept.
Indar Corp.
Indiana Steel Products Co., The
Magnetic Core Corp.
Permag Corp.

Hard—Other Types

Arnold Engineering Co., The
Henry L. Crowley & Co., Inc.
Ferroxcube Corp. of America
Stackpole Carbon Co.

Soft

American Sinteel Corp.
Arnold Engineering Co., The
Asco Sintering Co.
Bunting Brass & Bronze Co., The
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Ferroxcube Corp. of America
National Diamond Laboratory
Powdercraft Corp.

Iron Nickel

American Sinteel Corp.
Asco Sintering Co.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Ferro Powdered Metals
General Powdered Metal Products, Inc.
General Sintering Corp.
Kwikset Powdered Metal Products
Magnetic Core Corp.
Metal Powder Products, Inc.
Powdercraft Corp.

Iron Silicon

American Sinteel Corp.
Asco Sintering Co.
General Powdered Metal Products, Inc.

STRUCTURAL PARTS

Brass

American Sinteel Corp.
Asco Sintering Co.
Bassick Co.
Bound Brook Oil-less Bearing Co.
Bronz-Aloy Corp.
Picco Industries Div.
Ceromet, Inc.
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Compacted Metals Corp.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Eberhart Steel Products
Powdered Metals Div.
Engineered Plastics, Inc.
American Sinterings Div.
Ferro Powdered Metals
General Powdered Metal Products, Inc.
General Sintering Corp.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Johnson Bronze Co.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Lux Clock Mfg. Co.
Merriman Brothers, Inc.
National Molded Products, Inc.
Pacific Sintered Metals
Parker White-Metal Co.
Picco, Inc.
Presmet Corp., The
Reese Metal Products Corp.
Sintered Metals, Inc.
Standard Automation Products
Superior Carbon Products, Inc.
Symmco, Inc.
Wakefield Bearing Corp.
Western Sintering Co.
Wicks Corp., The
The United States Graphite Co. Div.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

Copper Base

Allied Products Corp.
Powdered Metal Parts Div.
American Powdered Metals, Inc.
American Sinteel Corp.
Asco Sintering Co.
Bound Brook Oil-less Bearing Co.
Brockway Pressed Metals, Inc.
Bronz-Aloy Corp.
Picco Industries Div.
Bunting Brass & Bronze Co., The
Ceromet, Inc.
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Compacted Metals Corp.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Eberhart Steel Products
Powdered Metals Div.
Engineered Plastics, Inc.
American Sinterings Div.
Ferro Powdered Metals
Ford Motor Co.
General Powdered Metal Products, Inc.
General Sintering Corp.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Johnson Bronze Co.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Lux Clock Mfg. Co.
Merriman Brothers, Inc.
Metal Powder Products, Inc.
Moraine Products Div.
General Motors Corp.
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Parker White-Metal Co.
Picco, Inc.
Powdercraft Corp.
Precision Metal Products Co.
Presmet Corp., The
Reese Metal Products Corp.
St. Marys Carbon Co.
Sintered Metals, Inc.
Standard Automation Products
Superior Carbon Products, Inc.
Symmco, Inc.
Wakefield Bearing Corp.
Western Sintering Co.
Wicks Corp., The
The United States Graphite Co. Div.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

Iron Base, Controlled Porosity

Allied Products Corp.
Powdered Metal Parts Div.
American Powdered Metals, Inc.
American Sinteel Corp.
Asco Sintering Co.
Bassick Co.
Bound Brook Oil-less Bearing Co.
Bronz-Aloy Corp.
Picco Industries Div.
Bunting Brass & Bronze Co., The
Burgess-Norton Mfg. Co.
Ceromet, Inc.
Chicago Powdered Metal Products Co.

which part should be made of metal powder?

We ask: **How will it be used in the end product of which it will be a component?** What are the loads, tolerances, and shape of the individual part? How will it be lubricated? Are there any special requirements such as hardness and finish? Do the quantities justify tooling costs?

These are the questions that were answered before any decisions were made on the parts shown above —both of which are made of metal powder.

Because Moraine Products can draw upon a wide range of experience with many different mass production processes and their applications to specific problems, our judgment on these questions can be considered sound. When we recommend metal powder, it is because we are convinced, in our own minds, that it is the material and the process best suited for the job the specific part must do.

Other Moraine Products include: Moraine power brakes—Delco hydraulic brake fluids, brake assemblies, master cylinders, wheel cylinders and parts—Moraine friction materials—porous metal parts—rolled bronze and bi-metal bushings—self-lubricating bearings, Moraine-400 and M-100 automotive engine bearings.

Another General Motors Value

Moraine Products
Division of General Motors, Dayton, Ohio

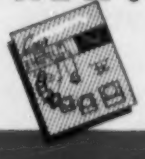
The hob (1) a replica in hard tool steel of the finished piece, is pressed into steel blanks to produce hobbed cavities (2) which are then machined (3) for insertion into a die shoe or mold frame.

CUT TOOL COSTS WITH NEWARK DIE HOBBED CAVITIES

Die hobbing is often the key to lower tool costs. This process produces steel cavities with a minimum of machining, filing and polishing operations . . . and adds the insurance of maximum uniformity in multiple cavity molds or dies.

What's more, as the steel alternately flows and condenses under the hobbing pressure, the mold takes a closer surface grain structure that more faithfully reproduces detail in the finished product.

NEW!



Write for your free copy of "How and When to Hob." Or let us discuss directly how Newark's complete die hobbing facilities and experience with all sizes and types of cavities may benefit you. No obligation, of course.

NEWARK DIE HOBBING AND CASTING CO.

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Compacted Metals Corp.
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Subsidiary of Dixon Crucible Co.
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Powdered Metals Div.
Engineered Plastics, Inc.
American Sinterings Div.
Ferro Powdered Metals
Ford Motor Co.
General Powdered Metal Products, Inc.
General Sintering Corp.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Johnson Bronze Co.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Lux Clock Mfg. Co.
Merriman Brothers, Inc.
Metal Powder Products, Inc.
Moraine Products Div.
General Motors Corp.
Pacific Sintered Metals
Parker White-Metal Co.
Picco, Inc.
Powdercraft Corp.
Precision Metal Products Co.
Presmet Corp., The
Reese Metal Products Corp.
Rossborough Supply Co.
St. Marys Carbon Co.
Sintered Metals, Inc.
Standard Automation Products
Superior Carbon Products, Inc.
Symmco, Inc.
Wakefield Bearing Corp.
Western Sintering Co.
Wicks Corp., The
The United States Graphite Co. Div.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

STRUCTURAL PARTS

Iron Base, High Density, Copper Free

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Asco Sintering Co.
Bassick Co.
Bound Brook Oil-less Bearing Co.
Bronz-Aloy Corp.
Picco Industries Div.
Bunting Brass & Bronze Co., The
Burgess-Norton Mfg. Co.
Ceromet, Inc.
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Compacted Metals Corp.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Eberhart Steel Products
Powdered Metals Div.
Engineered Plastics, Inc.
American Sinterings Div.
Ferro Powdered Metals
General Powdered Metal Products, Inc.

Globe Industries, Inc.
Supermet Div.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Lux Clock Mfg. Co.
Merriman Brothers, Inc.
Metal Powder Products, Inc.
Moraine Products Div.
General Motors Corp.
Pacific Sintered Metals
Parker White-Metal Co.
Picco, Inc.
Powdercraft Corp.
Presmet Corp., The
Reese Metal Products Corp.
Rossborough Supply Co.
St. Marys Carbon Co.
Sintered Metals, Inc.
Standard Automation Products
Wakefield Bearing Corp.
Western Sintering Co.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

STRUCTURAL PARTS
Iron Base, Infiltrated

Allied Products Corp.
Powdered Metal Parts Div.
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American Sinteel Corp.
Asco Sintering Co.
Bassick Co.
Bound Brook Oil-less Bearing Co.
Bronz-Aloy Corp.
Picco Industries Div.
Bunting Brass & Bronze Co., The
Burgess-Norton Mfg. Co.
Ceromet, Inc.
Chicago Powdered Metal Products Co.
Chrysler Corp.
Amplex Div.
Compacted Metals Corp.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Eberhart Steel Products
Powdered Metals Div.
Engineered Plastics, Inc.
American Sinterings Div.
Ferro Powdered Metals
Ford Motor Co.
General Powdered Metal Products, Inc.
General Sintering Corp.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Johnson Bronze Co.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Lux Clock Mfg. Co.
Merriman Brothers, Inc.
Metal Powder Products, Inc.
Moraine Products Div.
General Motors Corp.
National Molded Products, Inc.
Pacific Sintered Metals
Parker White-Metal Co.
Picco, Inc.
Powder Metal Products, Inc.
Powdercraft Corp.
Presmet Corp., The
Reese Metal Products Corp.
St. Marys Carbon Co.
Sintered Metals, Inc.
Standard Automation Products
Wakefield Bearing Corp.
Wicks Corp., The
The United States Graphite Co. Div.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

STRUCTURAL PARTS
Filters

Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
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Permanent Filter Corp.
Powdercraft Corp.
Wakefield Bearing Corp.

STRUCTURAL PARTS
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Asco Sintering Co.
Bound Brook Oil-less Bearing Co.

This part couldn't be made from powdered metal

The undercut sides wouldn't permit ejecting the compact from the die. Instead, you stamp out 12 steel segments—of seven different sizes—and rivet them together. *Result:* an expensively assembled tractor drive pulley.

says who? Powdercraft did it!

It took ingenious engineering, but Powdercraft's experienced designers worked out a tooling technique for economical powder metal production. As produced in iron powder, the pulley gives tremendously increased life. *Result:* significant reduction in production cost; weight reduced by one-third; assembly cost cut to zero.

Don't get the idea that Powdercraft thrives on "impossible" jobs. No company can. But the skilled men and modern equipment that solved this tractor manufacturer's production problem can help you realize the versatility and economy of powder metallurgy in your product's components. Whatever your powdered metal needs—bearings, machine parts, filters or friction materials—it will be well worth your while to get full details from

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What do you need?

Ductility?

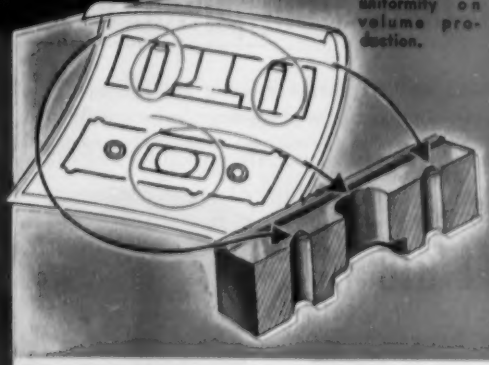
An example of the superior properties obtainable with the new Sintaloy process.

Sintered Brass?

Just one of the wide variety of alloys being fabricated by Sintaloy.

Uniformity?

Advanced techniques assure uniformity on volume production.



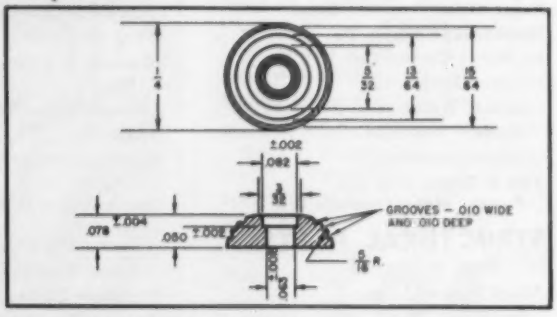
Write for your copy of "Advanced Powder Metallurgy" which describes Sintaloy's unusual plant facilities.

DIXON SINTALOY INC.
A subsidiary of The Joseph Dixon Crucible Company
535 Hope St. Stamford, Conn.

For more information circle No. 34 on the Reader Service Card

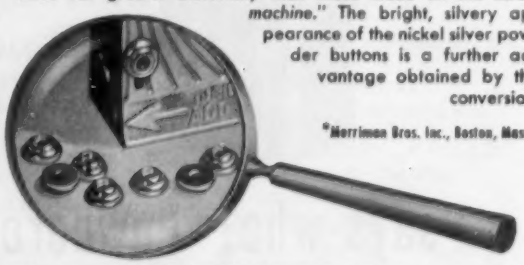
Master Rule Saves Exactly 50% Per Button with-

NICKEL SILVER POWDER PARTS



While the lock button (which holds measurements against creep) on the side of the "Tufboy" steel tape is a very *small* part of this overall assembly, *big* savings were obtained by turning to powder metallurgy. Formerly produced of stainless steel by screw machine at a cost of $.006 each, the buttons (below) are now pressed from nickel silver powder* at a 50% saving—$.003 each. Master Rule Manufacturing Co., Inc., states that, in addition to the lower cost, the nickel silver powder buttons *"have far greater uniformity than those made on the screw machine."* The bright, silvery appearance of the nickel silver powder buttons is a further advantage obtained by the conversion.

*Merriman Bros. Inc., Boston, Mass.



What can NONFERROUS POWDER PARTS do for you?

For detailed information on the design, properties, production and application of brass and other nonferrous powder parts you should have a copy of our manual. It will give you 24 case histories of brass and nickel silver powder structural parts to assist in evaluating this means of production in terms of your particular needs.

SEND FOR YOUR COPY

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Amplex Div.
Compacted Metals Corp.
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Powdered Metals Div.
Engineered Plastics, Inc.
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Ferro Powdered Metals
General Powdered Metal Products, Inc.
Indar Corp.
International Powder Metallurgy Co., Inc.
International Powder Metallurgy Co., Inc.
Rocky Mountain Metals Div.
Johnson Bronze Co.
Keystone Carbon Co.
Kwikset Powdered Metal Products
Merriman Brothers, Inc.
Metal Powder Products, Inc.
National Molded Products, Inc.
Parker White-Metal Co.
Picco, Inc.
Powdercraft Corp.
Presmet Corp., The
Reese Metal Products Corp.
Sintered Metals, Inc.
Standard Automation Products
Superior Carbon Products, Inc.
Wakefield Bearing Corp.
Western Sintering Co.
Wicks Corp., The
The United States Graphite Co. Div.
Yale & Towne Mfg. Co.
Powder Metal Products Div.

Stainless Steel
American Sinteel Corp.
Asco Sintering Co.
Chrysler Corp.
Amplex Div.
Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
Engineered Plastics, Inc.
American Sinterings Div.

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Cleveland Tool & Die Co.
Curtis Carbide Die Co.
Diecraft Tool Co.
Elizabeth Carbide Die Co., Inc.
Firth Sterling, Inc.
General Electric Co.
Carboloy Dept.
Micro-Carbide Tool & Die Co., Inc.
Monarch Tool & Gauge Co.
National Carbide Die Co.
National Diamond Laboratory
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Electric Furnace Co., The
Falcon Equipment Co.
Ferguson Equipment Corp.
Gas Machinery Co., The
General Electric Co.
Apparatus Sales Div.
Haller, Inc.
Harper Electric Furnace Corp.
C. I. Hayes, Inc.
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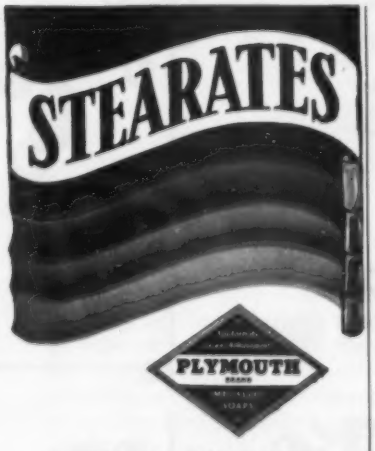
Holcroft & Co.
Leeds & Northrup Co.
Lindberg Engineering Co.
Lithium Co., The
Pereny Equipment Co.
Posey Iron Works, Inc.
Rockwell Co., W. S.
Sargeant & Wilbur, Inc.
Sentry Co., The
Sunbeam Corp.



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The most efficient lubricants for powdered metal molding. Reduces molding and ejection pressure. Improves metal powder flow characteristics. Controls part density. Prolongs die life.

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Precision Made... For Precision Performance

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precision made from exclusively formulated non-ferrous Sintroloy and Ductiloy are molded to close tolerances, thereby eliminating machining of intricate shape and high scrap loss.

Perhaps we may be able to help you solve specific parts problems. Get in touch with National Molded today for prompt attention.

Write today for detailed information and free literature on cost-saving standard bearings which are available from stock.

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GAF.

Carbonyl Iron Powders

These are spherical iron powders—as shown in the surrounding photomicrograph. Diameters run from 3 to 20 microns; in some types the iron content is as high as 99.6% to 99.9% . . . New types have recently been developed; there are today a total of 10—which may be classified as shown in this table.

FIRMNESS / PARTICLE SIZE RANGE	SOFT (EASILY COMPRESSIBLE TO HIGH DENSITIES)		HARD (PRESERVE SPHERICAL SHAPE UNDER PRESSURE)	
	"NORMAL"	SPECIAL FOR HIGH Q	"NORMAL"	SPECIAL FOR HIGH Q
COARSE	L	GQ-4	E	J
MEDIUM	HP	GS-6	TH	–
FINE	C	–	SF	W

*C HAS MEDIUM PARTICLE SIZE RANGE, BUT IS HARDER THAN HP.

Let us send you a 32-page book giving characteristics and applications . . . We invite you to call upon our research facilities and Technical Service Department for assistance in developing new applications or new products involving the use of any of these powders. We also invite inquiries for powders whose performance characteristics are different from those exhibited by any of our existing types . . . Kindly address Department 47.

From Research to Reality . . .

ANTARA **ANTARA. CHEMICALS**

A SALES DIVISION OF GENERAL ANILINE & FILM CORPORATION

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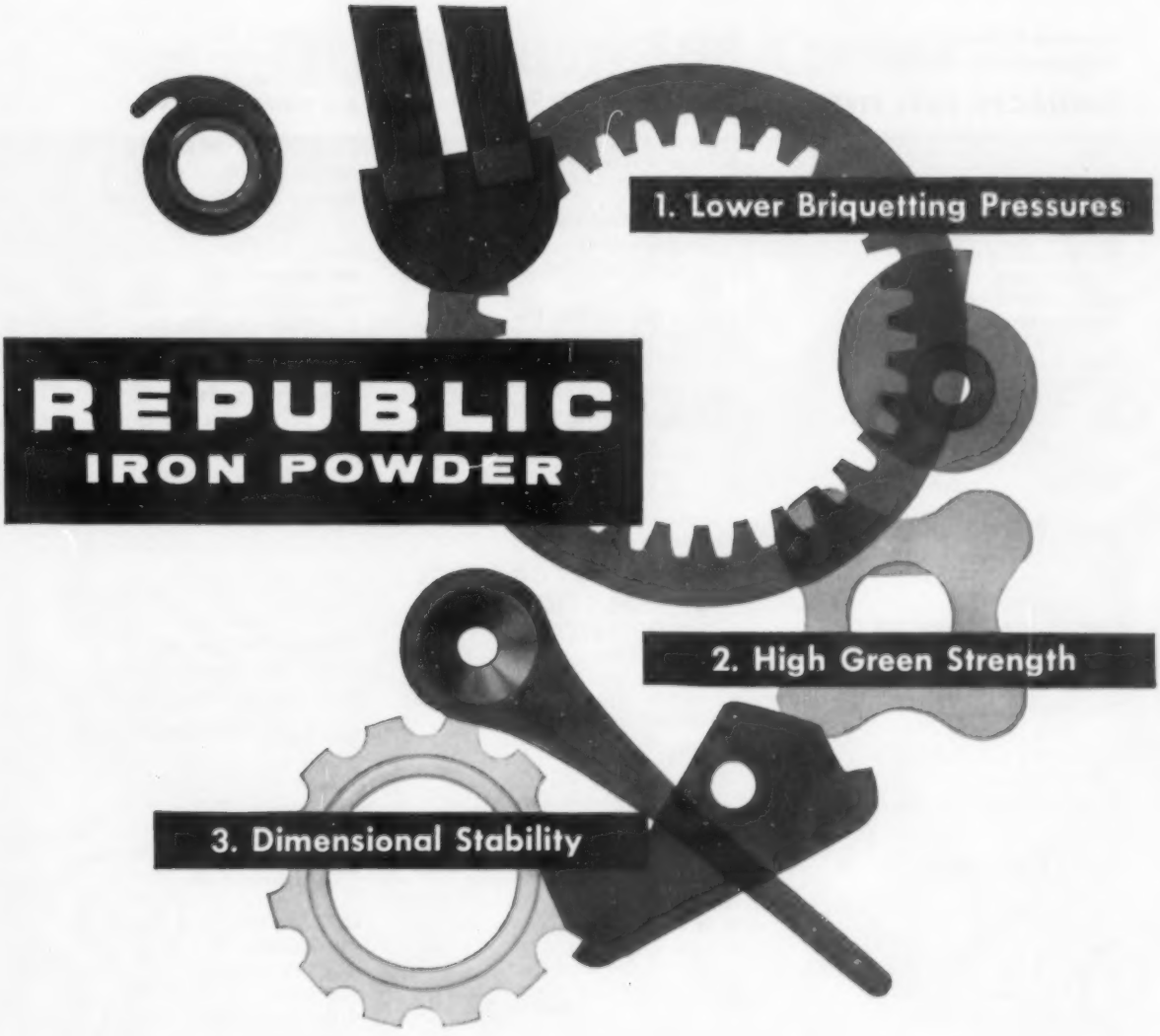

These features of Republic Iron Powder help simplify processing and handling—help you hit design goals of projected or production items. Special qualities of the base material and Republic's preparation process assure a consistently uniform powder from lot to lot. Particle size distribution and apparent density are carefully controlled. Acceptable limits on flow rate, hydrogen loss and chemical analysis have been established.

Our metallurgists and engineers are available to assist you in producing more uniform parts at minimum cost with Republic Iron Powder. Send the coupon for more information. Or . . .

STOP IN AND DISCUSS YOUR PROBLEM WITH US AT BOOTH 13, METAL POWDER ASSOCIATION SHOW, CLEVELAND, APRIL 10-12.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION
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Cleveland 27, Ohio

☐ Please send more information on Iron Powder;
☐ Have an engineer call.

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Company_____

Address_____

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C-1686

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Electric Furnace Co., The
Ferguson Equipment Corp.
Gas Machinery Co., The
Holcroft & Co.
Leeds & Northrup Co.
Lindberg Engineering Co.
Lithium Co., The
Posey Iron Works, Inc.
Rockwell Co., W. S.
Sargeant & Wilbur, Inc.
Sunbeam Corp.
Industrial Furnace Div.
Surface Combustion Corp.
Westinghouse Electric Corp.

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Ammonia Div.
Henry Bower Chemical Mfg. Co.
E. I. du Pont de Nemours Co.
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Hamler Industries, Inc.
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Electric Furnace Co., The
Ferguson Equipment Corp.
Gas Machinery Co., The
C. I. Hayes, Inc.
Hevi Duty Electric Co.
Holcroft & Co.
C. M. Kemp Mfg. Co., The
Lindberg Engineering Co.
Lithium Co., The
Rockwell Co., W. S.
Sargeant & Wilbur, Inc.
Surface Combustion Corp.
Westinghouse Electric Corp.

Partially Combusted (Endo-Thermic) Gas

Continental Industrial Engineers, Inc.
Electric Furnace Co., The
Ferguson Equipment Corp.
Gas Machinery Co., The
C. I. Hayes, Inc.
Hevi Duty Electric Co.
Holcroft & Co.
Lindberg Engineering Co.
Lithium Co., The
Sargeant & Wilbur, Inc.
Surface Combustion Corp.
Westinghouse Electric Corp.

Dissociated Ammonia

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Drever Co.
Electric Furnace Co., The
Gas Machinery Co., The
General Electric Co.
Apparatus Sales Div.
Haller, Inc.
C. I. Hayes, Inc.
Hevi Duty Electric Co.
Lindberg Engineering Co.
Lithium Co., The
Sargeant & Wilbur, Inc.
Surface Combustion Corp.
Westinghouse Electric Corp.

Liquid Hydrocarbon Decomposition

Continental Industrial Engineers, Inc.
Electric Furnace Co., The
Hevi Duty Electric Co.
Lithium Co., The

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American Metaseal Mfg. Corp.
Curd Enterprizes, Inc.
Multiplastics Div.
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American Cyanamid Co.
Metal Chemicals Section
Capital City Products Co., The
Foote Mineral Co.
Leffingwell Chemical Co.
Nopco Chemical Co.
M. W. Parsons-Plymouth, Inc.
Sun Chemical Corp.
Warwick Chemical Co. Div.
Joseph Turner & Co.
Whitaker, Clark & Daniels, Inc.
Witco Chemical Co.

MIXING & BLENDING EQUIPMENT

Abbe Engineering Co.
R. N. Bailey & Co., Inc.
A. Daigger & Co.
J. H. Day Co., Inc., The
Haller, Inc.
Read Standard Corp.
Robinson Mfg. Co.
F. J. Stokes Machine Co.
Sturtevant Mill Co.
Taunton Engineering Works

PRESSES, HYDRAULIC

American Steel Foundries
Elmes Engineering Div.
Baldwin-Lima-Hamilton Corp.
E. W. Bliss Co.
Clifton Hydraulic Press Co.
Denison Engineering Co.
Haller, Inc.
Hannifin Corp.
Kux Machine Co.
Lake Erie Engineering Corp.
Loomis Engineering & Mfg. Co.
M & N Hydraulic Press Co.
Oliver Corp., The
A. B. Farquhar Div.
Standard Machinery Co.
F. J. Stokes Machine Co.

PRESSES, MECHANICAL

Arnhold Ceramics, Inc.
Baldwin-Lima-Hamilton Corp.
E. W. Bliss Co.
Haller, Inc.
Kux Machine Co.
Minster Machine Co., The
F. J. Stokes Machine Co.

PYROMETRIC EQUIPMENT

Compensating Lead Wire

Barber-Colman Co.
Wheelco Instruments Div.
R. A. Ekstrom Co.
Claud S. Gordon Co.
Illinois Testing Laboratories, Inc.
Leeds & Northrup Co.
Minneapolis-Honeywell Regulator Co. Industrial Div.
Pyrometer Instrument Co.
Arklay S. Richards Co., Inc.
West Instrument Corp.

Fuel Failure Protective Devices

Barber-Colman Co.
Wheelco Instruments Div.
R. A. Ekstrom Co.
Illinois Testing Laboratories, Inc.
Minneapolis-Honeywell Regulator Co. Industrial Div.

Millivoltmeter Type Pyrometers (Indicating & Recording)

Barber-Colman Co.
Wheelco Instruments Div.
R. A. Ekstrom Co.
Claud S. Gordon Co.
Illinois Testing Laboratories, Inc.
Minneapolis-Honeywell Regulator Co. Industrial Div.
Pyrometer Instrument Co., Inc.
Simpson Electric Co.
West Instrument Corp.

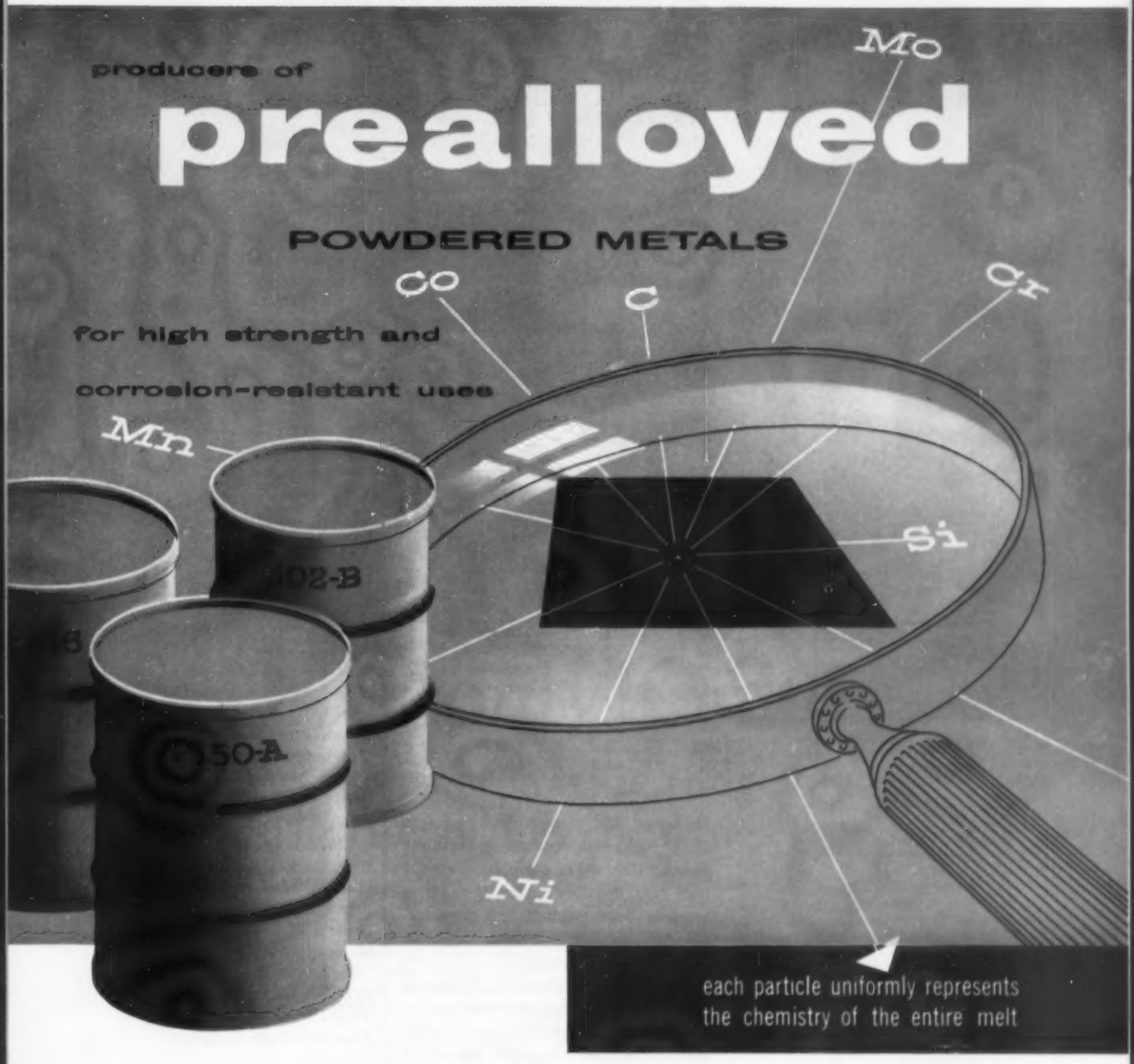
Optical Pyrometers

Barber-Colman Co.
Wheelco Instruments Div.
Leeds & Northrup Co.
Pyrometer Instrument Co.

Potentiometer Type Pyrometers (Indicating & Recording)

Barber-Colman Co.
Wheelco Instruments Div.
R. A. Ekstrom Co.
General Electric Co.
Apparatus Sales Div.
Claud S. Gordon Co.
Illinois Testing Laboratories, Inc.
Leeds & Northrup Co.
Minneapolis-Honeywell Regulator Co. Industrial Div.
West Instrument Corp.

VANADIUM-ALLOYS STEEL COMPANY



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Minneapolis-Honeywell Regulator Co.
Industrial Div.
West Instrument Corp.

Thermocouples
Barber-Colman Co.
Wheelco Instruments Div.
R. A. Ekstrom Co.
General Electric Co.
Apparatus Sales Div.
Claud S. Gordon Co.
Illinois Testing Laboratories, Inc.
Leeds & Northrup Co.
Minneapolis-Honeywell Regulator Co. Industrial Div.
Pyrometer Instrument Co.
Arklay S. Richards Co., Inc.
Service Associated, Inc.
Simpson Electric Co.
West Instrument Corp.
Winslow Co., Inc., The

Thermocouple Failure Protective Devices
Barber-Colman Co.
Wheelco Instruments Div.
General Electric Co.
Apparatus Sales Div.
Illinois Testing Laboratories, Inc.
Minneapolis-Honeywell Regulator Co.
Industrial Div.
West Instrument Corp.

Thermocouple Protective Tubes
Barber-Colman Co.
Wheelco Instruments Div.
R. A. Ekstrom Co.
Claud S. Gordon Co.
Illinois Testing Laboratories, Inc.
Leeds & Northrup Co.
Minneapolis-Honeywell Regulator Co. Industrial Div.
Arklay S. Richards Co., Inc.
Service Associated, Inc.
West Instrument Corp.

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A. Daigger & Co.
J. H. Day Co., Inc., The
Exolon Co., The
B. F. Gump Co.
Robinson Mfg. Co.
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Charles Hardy, Inc.
Metals Disintegrating Co., Inc.
Reade Mfg. Co., Inc.
Reynolds Metals Co.

BRASS
60-40
Charles Hardy, Inc.
New Jersey Zinc Co., The

70-30
Glidden Co., The
Charles Hardy, Inc.
New Jersey Zinc Co., The

80-20
Glidden Co., The
Charles Hardy, Inc.
Malone Metal Powders
New Jersey Zinc Co., The

COPPER
Atomized
Belmont Smelting & Refining Works, Inc.
Charles Hardy, Inc.
Malone Metal Powders
Metals Disintegrating Co., Inc.
New Jersey Zinc Co., The

Electrolytic
American Metal Co. Ltd., The
Belmont Smelting & Refining Works, Inc.
Greenback Industries, Inc.
Charles Hardy, Inc.
Metals Disintegrating Co., Inc.

Precipitated, Hydrogen Reduced
Whitaker Metals Corp.

Sponge
Glidden Co., The
Metals Disintegrating Co., Inc.

IRON
Atomized
Easton Metal Powder Co., Inc.
Ferrum Limited
Foote Mineral Co.
Charles Hardy, Inc.
Metal Powders Limited

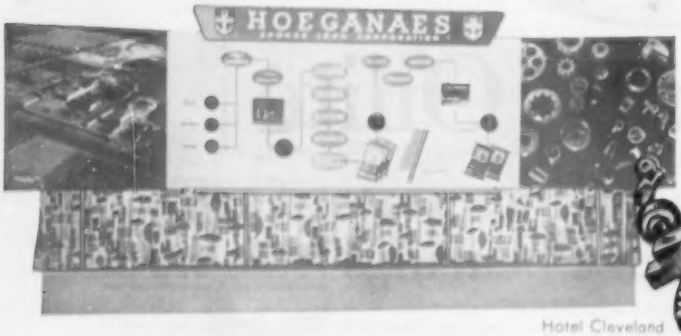
Carbonyl
Belmont Smelting & Refining Works, Inc.
General Aniline & Film Corp.
Antara Chemicals Div.
Magnetic Powders, Inc.

Decarburized Cast Iron
Easton Metal Powder Co., Inc.
Charles Hardy, Inc.
Metal Powders Limited

Electrolytic
A. Johnson & Co., Inc.
National-U.S. Radiator Corp.
Plastic Metals Div.
Pyron Corp.

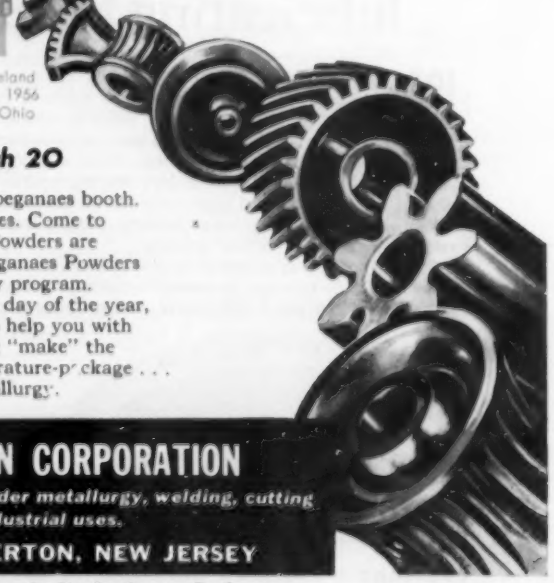
Hydrogen Reduced
Charles Hardy, Inc.
Magnetic Powders, Inc.
Pyron Corp.
Republic Steel Corp.
Alloy Div.
C. K. Williams & Co.

Sponge
Ferrum Limited
Charles Hardy, Inc.
Hoeganaes Sponge Iron Corp.
Metal Powders Limited
Micronized Metals, Inc.
National-U.S. Radiator Corp.
Plastic Metals Div.



YOU'VE GOT A DATE AT THE METAL POWDER SHOW

Hotel Cleveland
April 10-12, 1956
Cleveland, Ohio



—and here's the meeting place—Booth 20

While you're at the show, be sure to stop-in at the Hoeganaes booth. See parts with intricate projections and close tolerances. Come to know the role that superior Hoeganaes Sponge Iron Powders are playing in Powder Metallurgy today. Learn why Hoeganaes Powders can play an important role in your powder metallurgy program. But—facts are not available just at show-time. Every day of the year, Hoeganaes Technical Representatives are available to help you with your powder metallurgy problems. If you can't "make" the show . . . why not write for the Hoeganaes literature-package . . . helpful information on up-to-date powder metallurgy.

HOEGANAES

HOEGANAES SPONGE IRON CORPORATION

Manufacturer of Sponge Iron Powder for powder metallurgy, welding, cutting and scarfing, and other industrial uses.

General Offices and Plant • RIVERTON, NEW JERSEY

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Glidden Co., The
Charles Hardy, Inc.
Metals Disintegrating Co., Inc.
National Lead Co.

NICKEL
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Charles Hardy, Inc.
Metals Disintegrating Co., Inc.
Micronized Metals, Inc.
National-U.S. Radiator Corp. Plastic Metals Div.
Pyron Corp.
Vanadium-Alloys Steel Co.

NICKEL CHROMIUM
Metal Hydrides, Inc.

NICKEL SILVER
Belmont Smelting & Refining Works, Inc.
Charles Hardy, Inc.
Metals Disintegrating Co., Inc.
New Jersey Zinc Co., The
Reade Mfg. Co., Inc.

STEEL
High Alloy
Charles Hardy, Inc.
Vanadium-Alloys Steel Co.

Low Alloy
Charles Hardy, Inc.
Metal Powders Limited
Pyron Corp.
Vanadium-Alloys Steel Co.

Plain Carbon
Charles Hardy, Inc.
Metal Powders Limited
National-U.S. Radiator Corp. Plastic Metals Div.
Vanadium-Alloys Steel Co .

Stainless
Alloy Metal Powders, Inc.
Charles Hardy, Inc.
Micronized Metals, Inc.
Uniworld Research Corp. of America
Vanadium-Alloys Steel Co.

TITANIUM
United International Research, Inc.

TIN
American Metal Co. Ltd., The
Belmont Smelting & Refining Works, Inc.
Glidden Co., The
Greenback Industries, Inc.
Charles Hardy, Inc.
Metals Disintegrating Co., Inc.
National Lead Co.
Reade Mfg. Co., Inc.

ZINC
Belmont Smelting & Refining Works, Inc.
Charles Hardy, Inc.
Metals Disintegrating Co., Inc.
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Reade Mfg. Co., Inc.

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For Outstanding Structural Parts, Porous Media and Self-Lubricating Parts Requiring Any or All of These Properties . . .

- SUPER-CORROSION RESISTANCE
- HEAT RESISTANCE
- HIGHER DENSITY
- HIGH DEGREE OF HARDNESS
- HIGH IMPACT STRENGTH
- HIGH TENSILE STRENGTH

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POWDERED METAL DIVISION
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185 Amory Street, Boston 30, Massachusetts

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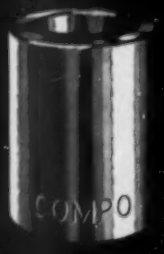
NO SIDE LINE



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Northville, Mich.

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Cleveland, O.

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North Haven, Conn.

American Sinteel Corp.
320 Yonkers Ave.
Yonkers, N. Y.

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Marengo, Ill.

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Los Angeles, Cal.

Bassick Co.
437 Howard
Bridgeport, Conn.

Bound Brook Oil-less Bearing Co.
Lincoln Blvd.
Bound Brook, N. J.

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Brockway, Pa.

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Picco Industries Div.
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Sierra Madre, Cal.

Bunting Brass & Bronze Co., The
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Toledo, O.

Burgess-Norton Mfg. Co.
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Geneva, Ill.

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Amplex Div.
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Henry L. Crowley & Co., Inc.
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Dixon Sintaloy, Inc.
Subsidiary of Dixon Crucible Co.
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Mishawaka, Ind.

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American Sinterings Div.
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North Chicago, Ill.

Ferro Powdered Metals
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Salem, Ind.

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Firth Sterling, Inc.
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Pittsburgh, Pa.

Ford Motor Co.
3000 Schaefer Rd.
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General Electric Co.
Carboloy Dept.
11177 E. Eight Mile Rd.
Detroit, Mich.

General Metals Powder Co.
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General Powdered Metal Products, Inc.
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Norwalk, Conn.

General Sintering Corp.
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Schiller Park, Ill.

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Supermet Div.
Dayton, O.

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International Powder Metallurgy Co., Inc.
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Johnson Bronze Co.
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New Castle, Pa.

Kennametal, Inc.
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Latrobe, Pa.

Keystone Carbon Co.
State Street
St. Marys, Pa.

Kwikset Powdered Metal Products
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Anaheim, Cal.

Lux Clock Mfg. Co.
Waterbury, Conn.

Magnetic Core Corp.
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Indianapolis, Ind.

Merriman Brothers, Inc.
187 Amory
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BIG 4

hydraulic series

These powerful high tonnage presses—fully hydraulic in operation—provide upper and LOWER punch pressure — deep die fills up to 10"—and complete adjustable control over punch timing and length of stroke.

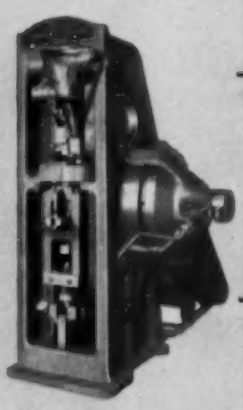
An entire range of sizes and models, both mechanically and hydraulically operated, is available in the KUX family of powder metal presses, a few of which are illustrated at the right.

MODEL 450B

Mechanical — Big 4 Series. 50 tons total pressure . . . tablets up to 6" diameter . . . depth of fill, 3" . . . up to 25 tablets per minute.

MODEL 65B

Toggle Type Heavy Duty Press. 75 tons total pressure . . . tablets up to 3" diameter . . . depth of fill, either 3" or 3⅜" . . . up to 25 tablets per minute.

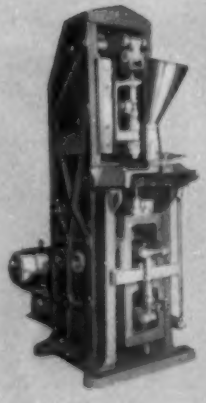


MODEL 64

Multiple Motion Press. 30 tons total pressure . . . tablets up to 3" diameter . . . depth of fill, either 2¼" or 4½" . . . up to 25 tablets per minute.

MODEL 74

Multiple Motion Press. 50 tons total pressure . . . tablets up to 5" diameter . . . depth of fill, either 5½" or 8" . . . up to 15 tablets per minute.

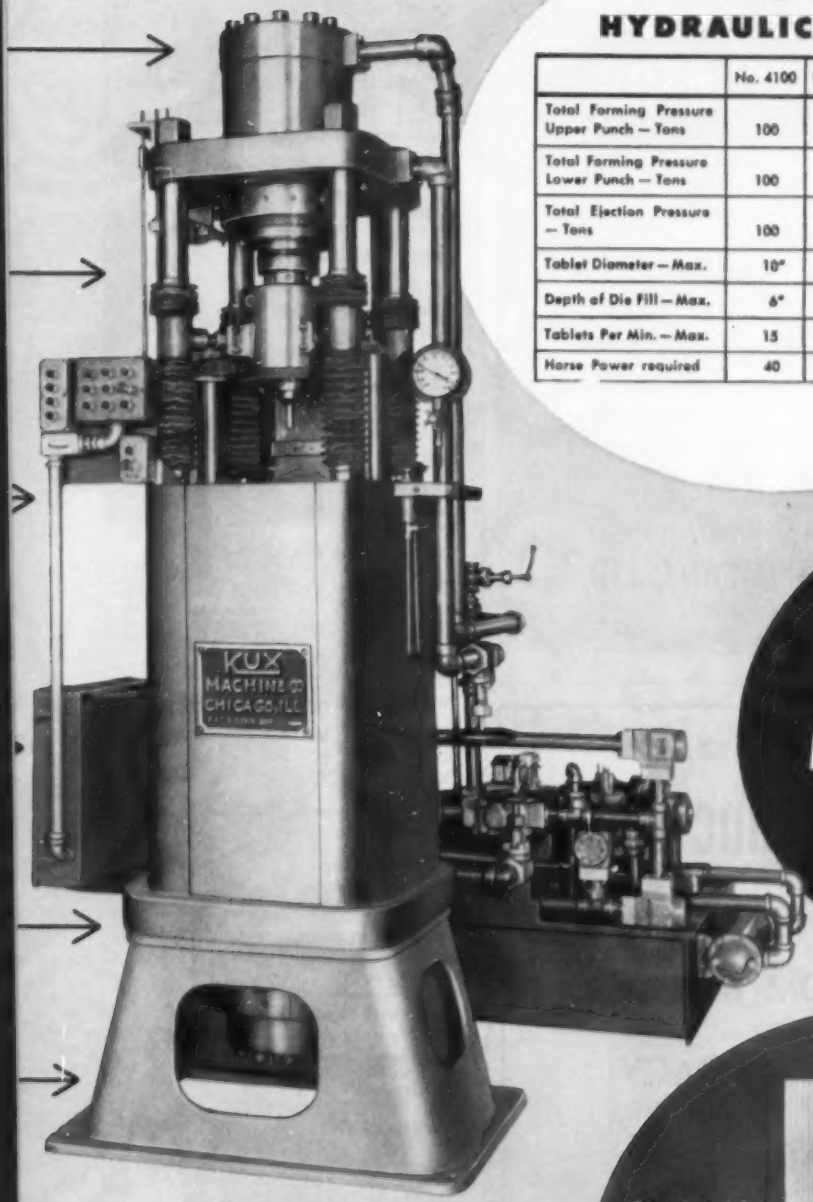


- **FULLY HYDRAULIC** applies pressure to tablet with both upper and lower punches. Lower punch ejects tablet with full forming pressure.
- **COMPLETELY AUTOMATIC** pushbuttons operate machine continuously or through a single cycle with an automatic stop position. Emergency stop control is also provided.
- **ACCURATE DIMENSIONAL THICKNESS OF TABLETS** upper and lower punches come to a positive mechanical stop position, holding the desired thickness of each tablet.
- **ALWAYS TRUE DENSITY** upper and lower punches can be adjusted to come to a hydraulic pressure stop position, applying exact pressure on the tablet to give true density regardless of variation in die fill.
- **PERFECT PUNCH AND DIE ALIGNMENT** take-up bushings on tie bars permit punches and die to be held in perfect alignment.
- **SIMPLE ADJUSTMENT AND LOCKING** of die fill and upper and lower pressure strokes.
- **QUICK, EASY TOOL CHANGEOVERS** because punches, die and core rod mountings are readily accessible.
- **ACCURATE DIE FILLING** with hydraulically operated shuttle-type shoe. Controlled speed of movement.

MODEL 4100—100 TONS TOTAL PRESSURE—
TABLETS UP TO 10" DIAMETER—6" MAXIMUM DEPTH OF DIE FILL

BIG 4 HYDRAULIC MODELS

	No. 4100	No. 4200	No. 4300	No. 4500
Total Forming Pressure Upper Punch — Tons	100	200	300	500
Total Forming Pressure Lower Punch — Tons	100	200	300	500
Total Ejection Pressure — Tons	100	200	300	500
Tablet Diameter — Max.	10"	12"	15"	15"
Depth of Die Fill — Max.	6"	8"	10"	10"
Tablets Per Min. — Max.	15	10	10	8
Horse Power required	40	50	60	100



KUX
MACHINE CO.

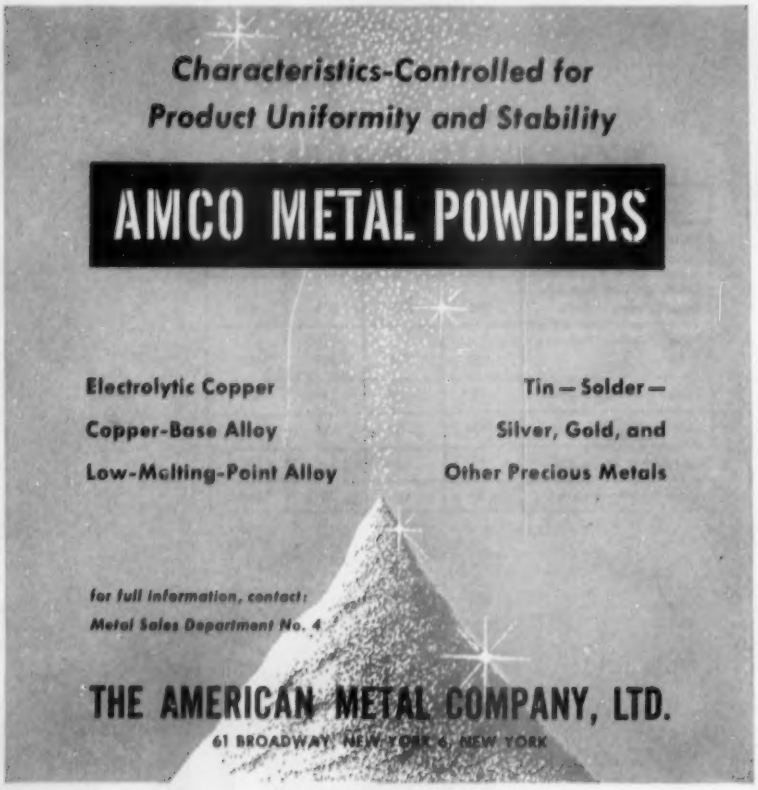
6725 North Ridge Avenue
Chicago 26, Illinois

The Model 4100 is also available with a movable die table and a movable lower core mechanism. The latter can be used even while a stationary core is utilized. Has a full 6-inch stroke and can withstand 40 tons total pressure. Timing mechanism allows movable core rod to operate up or down during any portion of the timing cycle.

Rear view of the Model 4100 Press showing hydraulic equipment, the supply hopper and electric panel box.

For more information circle No. 58 on the Reader Service Card

For more information circle No. 13 on the Reader Service Card



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PARTS MADE FROM METAL
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we specialize in

SERVICE

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New York, N. Y.

National Molded Products, Inc.
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St. Marys, Pa.

National Moldite Co.
1412 Chestnut Ave.
Hillside, N. J.

Pacific Sintered Metals
7728 El Manor Ave.
Los Angeles, Cal.

Parker White-Metal Co.
2153 McKinley Ave.
Erie, Pa.

Permag Corp.
214 Taaffe Place
Brooklyn, N. Y.

Permanent Filter Corp.
1300 W. Washington Blvd.
Los Angeles, Cal.

Picco, Inc.
72 E. Montecito
Sierra Madre, Cal.

Powder Metal Products, Inc.
500 S. St. Marys
St. Marys, Pa.

Powdercraft Corp.
746 Hayne
Spartanburg, S. C.

Precision Metal Products Co.
P. O. Box 129
Ellwood City, Pa.

Presmet Corp., The
112 Harding
Worcester, Mass.

Pyroferric Co., Inc.
621 E. 216
New York, N. Y.

Quality Components, Inc.
St. Marys, Pa.

Radio Cores, Inc.
9540 Tulley Ave.
Oak Lawn, Ill.

Raybestos-Manhattan, Inc.
61 Willett
Passaic, N. J.

Reese Metal Products Corp.
537 Howard Ave.
Lancaster, Pa.

Rossborough Supply Co.
3376 W. 137
Cleveland, O.

St. Marys Carbon Co.
State Road
St. Marys, Pa.

Shieldalloy Corp.
99 Park Ave.
New York, N. Y.

Sintercast Corp. of America
134 Woodworth Ave.
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Sintered Metals, Inc.
3400 Washington
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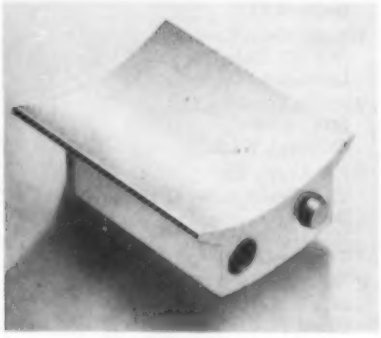
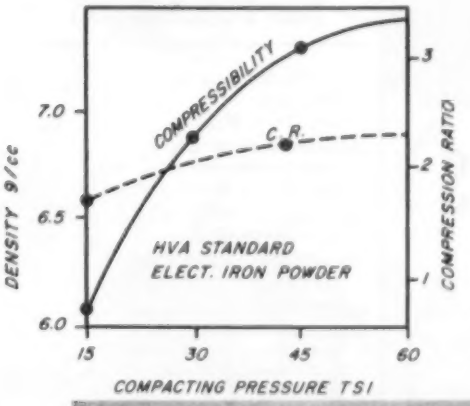
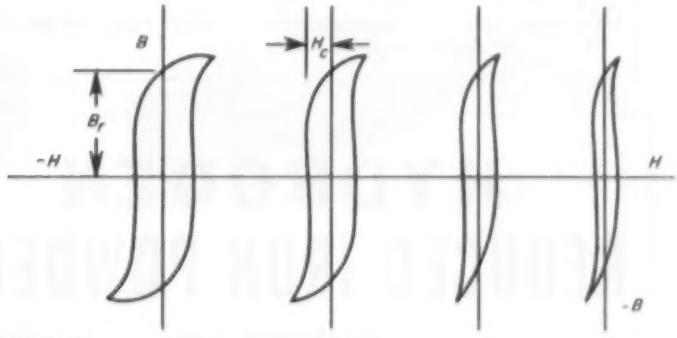


This pole piece weighs almost one pound. It replaces a stacked lamination in a five horsepower DC motor for an industrial lift truck. The magnetic characteristics of the powdered metal pole piece have proved to be very satisfactory in this application. Fabricator: Yale & Towne Mfg. Co., Powdered Metal Products Div.

The Greeks had a letter for it — μ — to express the ease with which a magnetizing force (created by an electric coil) can induce a magnetic field concentration (flux density) in a material. This ability of materials to become magnetic is called permeability. The higher the μ value the easier to magnetize. Some materials are readily magnetized to provide low strength magnets, but require a large electro-magnetic force when high strength magnets are required. By mixing silicon with HVA Standard Electrolytic Iron Powder a sintered steel is formed which has high magnetic saturation in combination with high permeability. This steel is an excellent core material for electro-magnetic pole pieces.





PERCENT Si	0	2	4	6
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H_c (COERCIVE FORCE)	1.50	1.14	.80	.57

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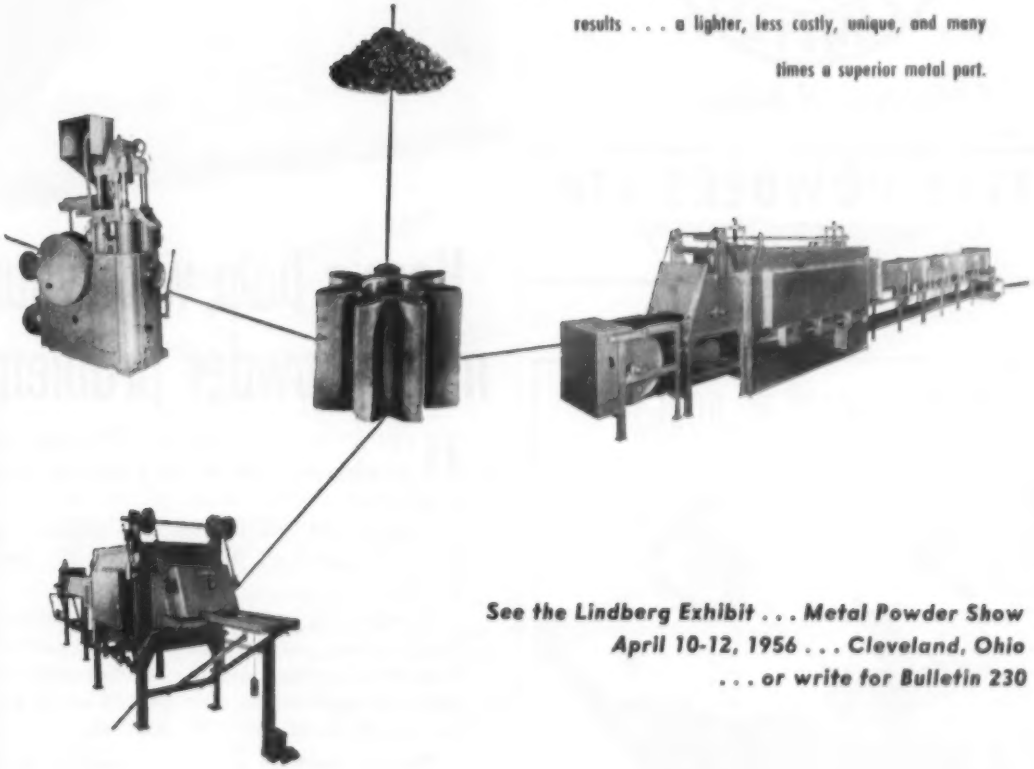

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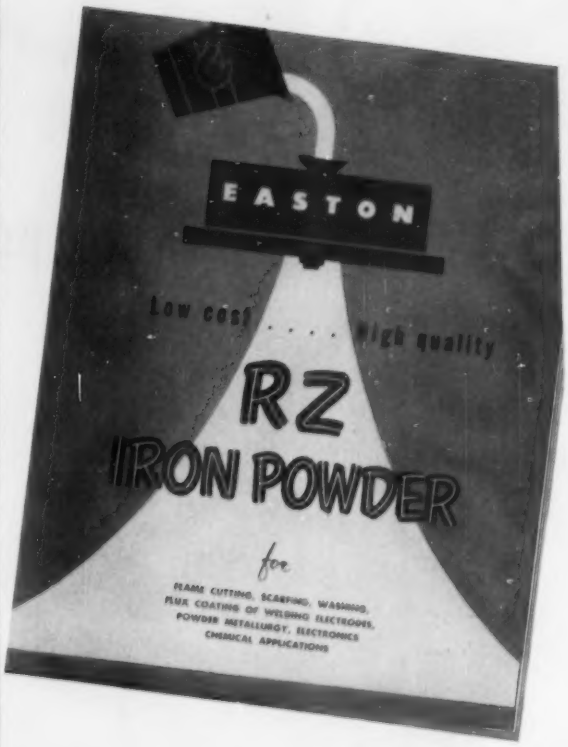

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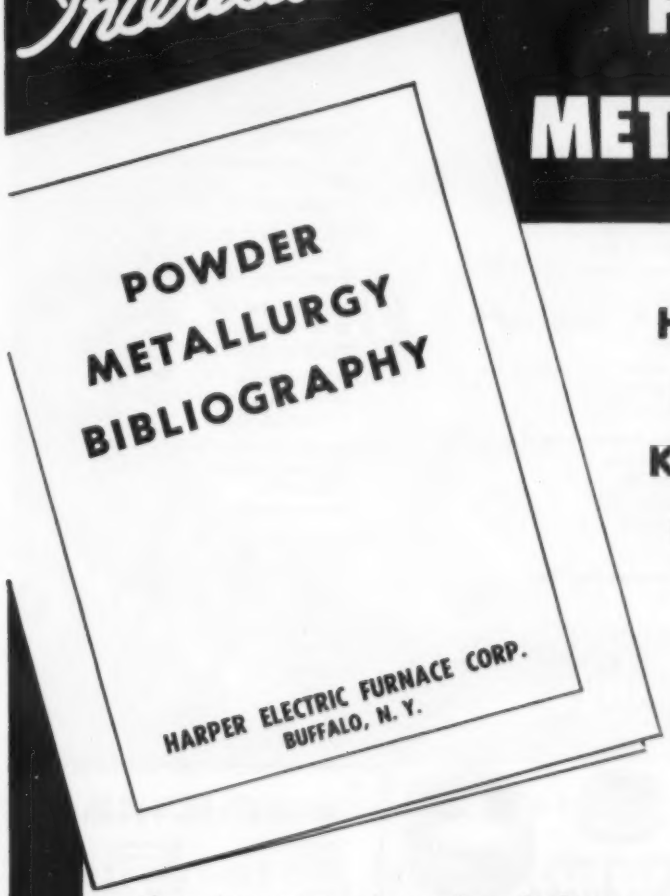

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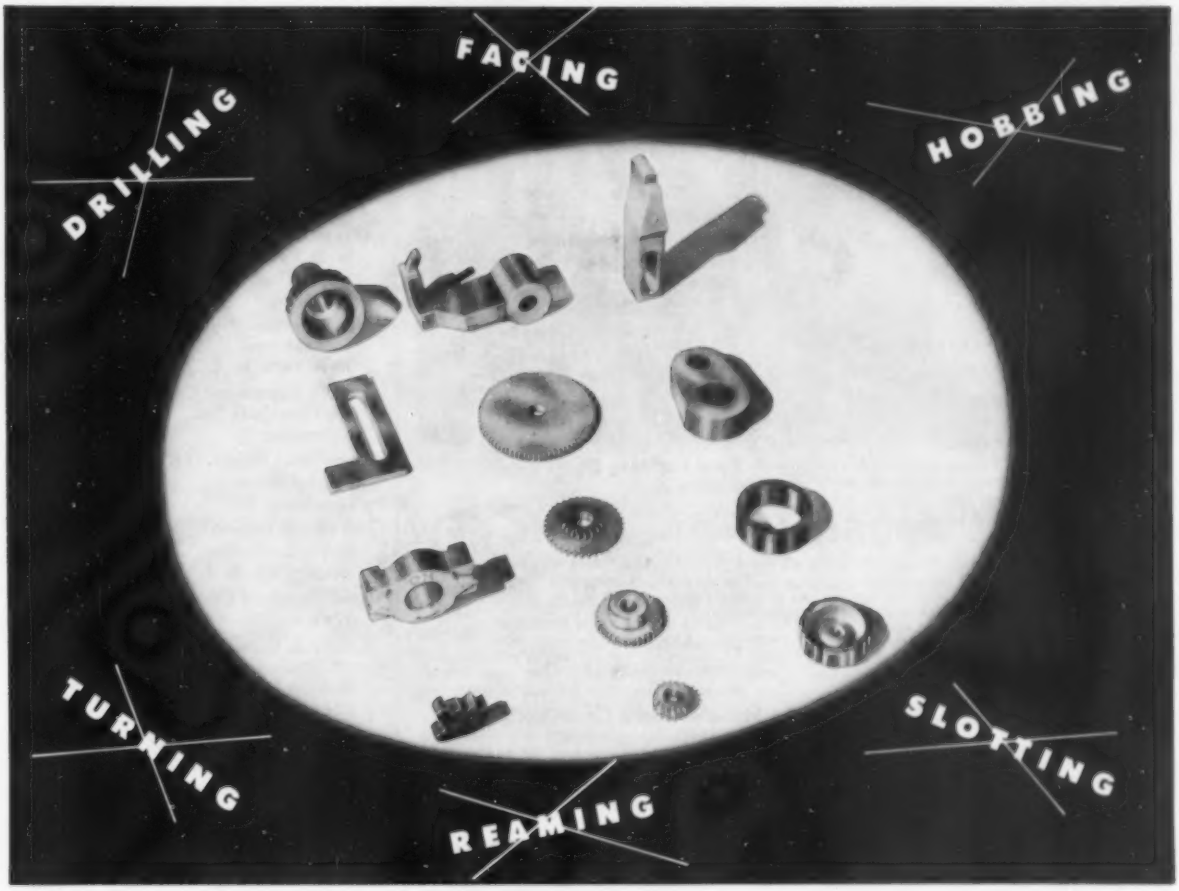

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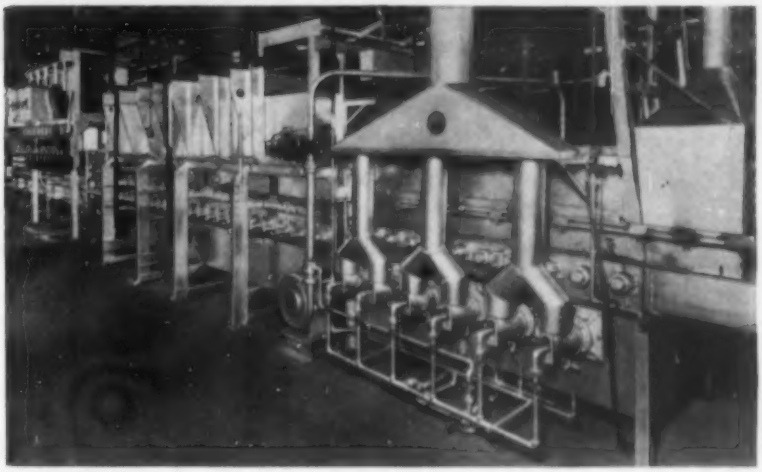

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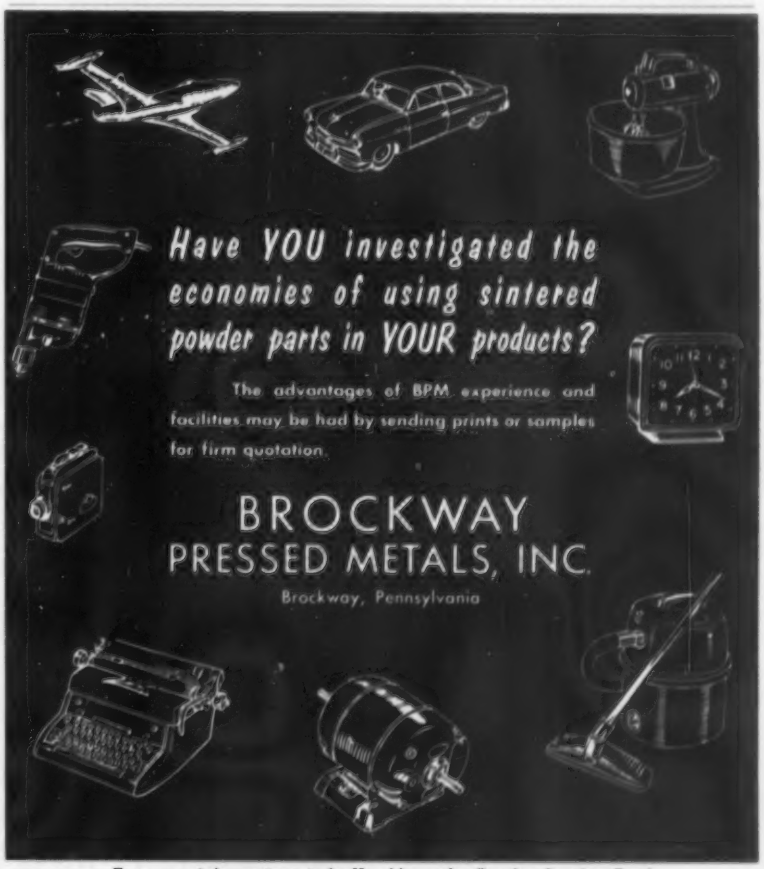
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Riverton, N. J.

A. Johnson & Co., Inc.
21 West Street
New York, N. Y.

Magnetic Powders, Inc.
Fairview Ave.
Johnsonburg, Pa.

Malone Metal Powders
220 W. 42
New York, N. Y.

Metal Hydrides, Inc.
12-24 Congress
Beverly, Mass.

Metal Powders Limited
73 Fifth Ave.
Iberville, Quebec, Canada

Metals Disintegrating Co., Inc.
901 Lehigh Ave.
Elizabeth "B", N. J.

Micronized Metals, Inc.
38-13 Tenth St.
Long Island City, N. Y.

National Lead Co.
111 Broadway
New York, N. Y.

National-U.S. Radiator Corp.
Plastic Metals Div.
201 Bridge
Johnstown, Pa.

New Jersey Zinc Co., The
160 Front
New York, N. Y.

Pyron Corp.
Box E, LaSalle Station
Niagara Falls, N. Y.

Reade Mfg. Co., Inc.
P. O. Box F
Lakehurst, N. J.

Republic Steel Corp.
Alloy Div.
410 Oberlin Rd., S.W.
Massillon, O.

Reynolds Metals Co.
2500 S. Third
Louisville, Ky.

United International Research, Inc.
38-15 30th Street
Long Island City, N. Y.
(titanium)

Uniworld Research Corp. of America
1302 Ontario
Cleveland, O.

Vanadium-Alloys Steel Co.
Latrobe, Pa.
(dies and tools, nickel, steel)

Whitaker Metals Corp.
1301 Burlington
N. Kansas City, Mo.

C. K. Williams & Co.
2001 Lynch
E. St. Louis, Ill.

Martin-Parry Corporation saves money and maintains quality with

ACCURATE Die Castings

■ To produce a better, lighter sweeper at lower cost, the Martin-Parry Corporation uses ACCURATE aluminum die castings. They were sure that each casting would meet their exacting specifications and that all commitments would be fulfilled. Here are a few advantages obtained from die castings:

- Light weight
- Smooth surfaces
- Dimensional accuracy
- High strength
- Low unit cost
- Laboratory controlled quality

Whenever your product requires castings, it will pay you to investigate the many cost-saving advantages of die castings and the qualifications of ACCURATE.

Write for brochure on facilities available.

Major Producer of Aluminum, Zinc and Magnesium Die Castings

ACCURATE DIE CASTING CO.
3089 E. 80th STREET • CLEVELAND 4, OHIO

For more information circle No. 1 on the Reader Service Card

← *For more information circle No. 23 on the Reader Service Card*

The **SHAW Process** for precision investment casting

Announcing the establishment of the Shaw Process Development Corp., organized to license and develop the Shaw Process in all of North and South America.

A new pilot foundry and research center has been built at Port Washington, N. Y., primarily to train the personnel of licensees in the practice of this production-proven precision casting technique.

The Shaw Process is being used successfully in the production and development of aircraft, gas turbine, engine, and airframe parts; general steel, alloy steel, and non-ferrous castings; dies and molds for the die casting, plastic, forging, shell molding, glass and rubber industries.

Below are listed some of the internationally recognized firms among our licensees:

ROLLS-ROYCE LTD.

THE BRITISH THOMPSON HOUSTON CO.

LEBANON STEEL FOUNDRY

CIE ELECTRO-MECANIQUE

SULZER BROTHERS

OTTO JUNKER

WERKSPOOR N.V.

ARMSTRONG SIDDELEY

THE DE HAVILAND ENGINE CO.

Inquiries from reputable organizations interested in our licensing program are now being solicited.

SHAW PROCESS DEVELOPMENT CORP.

Division of British Industries Corp.
Port Washington, N. Y.

Circle No. 30 on the Reader Service Card

All companies listed are believed to be fabricators except as noted. Some of these listings supplied by: Hoganas-Billesholms Aktiebolag, A. Johnson & Co., Powder Metallurgy, Ltd. and American Electro Metals, Inc.

EUROPEAN DIRECTORY OF POWDER METALLURGY

AUSTRIA

Gebr. Bohler & Co. AG
Wein

Eisenwerk Breitenfeld G.m.b.H.
Wartberg/Murtzal Stmk

Metallwerk Plansee G.m.b.H.
Reutte/Tyrol

BELGIUM

Anciennes Usines Montefiore
15, rue de Douvres
Anderlecht, Brussels

Belgian Tool Co. S. A.
Malines

Ateliers R. Laurent
Koningsloo-Vilvorde

Ets. Andre Van Lerberghe S.
Place Du Peuple 18
Courtrai

ENGLAND

Bound Brook Bearings Limited
Trent Valley Trading Estate
Trent Valley Road
Lichfield, Staffs

British Thomson-Houston Co. Ltd.
Rugby

George Cohen Sons & Co., Ltd.
Broadway Chambers
London, W. 6
(powder)

Darwins Ltd.
Sheffield

Dualloys Limited
Boden Works
Boden Street
Chard, Somerset

Hard Metal Tools Ltd.
Torrington Avenue
Coventry

Loewy Engineering Co. Ltd., The
Wallisdown Road
Bournemouth

McKechnie Brothers Limited
14, Berkeley Street
London, W. 1
(powder)

Manganese Bronze & Brass Co. Ltd.

Elton Park Works
Hadleigh Road
Ipswich, Suffolk

Metal & Plastic Compacts Ltd.
Montgomery Street
Birmingham 11

Morgan Crucible Co. Ltd.
Battersea Church Road
London, S.W. 1

Mullard Blackburn Works Ltd.
Blackburn, Lancs

Murex Limited
Rainham, Essex

New London Electron Works Ltd.
East Ham
London, E. 6

Plessey Co. Ltd., The
Ilford, Essex

Powder Metallurgy Ltd.
59-62 High Holborn
London, W.C. 1
(powder)

John Rigby & Sons Limited
Rawfolds Wire Mills
Cleckheaton, Yorks

Salford Electrical Instruments
Salford 3, Lancs

Sheepbridge Equipment Ltd.
Sheepbridge Works
Chesterfield, Derbyshire
(equipment)

Sintered Products Limited
Hamilton Road
Sutton-In-Ashfield, Notts

Swift Levick & Sons Ltd.
Clarence Steel Works
Sheffield 4, Yorkshire

A. C. Wickman Co.
Coventry

FRANCE

Le Carbone-Lorraine S.A.
45, rue des Acacias
Paris 17E

Societe D'Electro-Chimie D'Ugine
Rue Ampere 60
Grenoble

Fonderies De Precision
32 Bvd. National
Nanterre (Seine)

Societe Des Forges Et Ateliers Du Creusot
Le-Creusot (Saone et Loire)

Societe Francaise Des Acieries De Blanc-Misseron
Quievrechain (Nord)

Cie Generale De Telegraphie Sans Fil
79 Bvd. Haussmann
Paris, France

Ste. Des Hauts-Fourneaux Et Forges D'Allevard
Allevard Isere

Societe Le Baillet
Le Bourget (Seine)

Marret Bonnin Lebel & Guieu Reunis
Rue De Montmorency 13
Paris III

Manufacture De Machines Du Haut-Rhin
25 Rue De Lisbonne
Paris

Metafram
Pontlde-Claix (Isere)

La Metallurgie des Poudres
Beauchamp (S. & O.)

Orega
Vincennes (Seine)

Spiden S. A.
83 Ave. des Champs Elysee
Paris

GERMANY

Bleistahl G.m.b.H.
Witten-Bommern, Germany

Robert Bosch G.m.b.H.
Stuttgart-Feuerbach, Germany

Degussa-Wolfgang
Wolfgang b. Hanau (Main)
(equipment)

Demag, Ag., Abt. Metallguss
Wetter/Ruhr

Deutsche Edelstahlwerke AG
Magnetfabrik Dortmund
Ostkirchstr. 177
Dortmund-Aplerbeck, Germany

Continued on page 126

OPPORTUNITIES

Rates: $20 for the first column inch, $15 for each additional inch payable in advance

FOR SALE—Eclipse—600 lb. per hour, dry hearth furnace. Gas fired. Wheelco controls. Used six months. Ajax—20 KW spark gap converter, with 2—17 lb. portable furnaces. Write Box 4156, PRECISION METAL MOLDING magazine.

INTERNATIONALLY KNOWN manufacturer offers a profitable agency arrangement for a man with a successful background in industrial sales and preferably specific experience in metal finishing. Our line is well established and nationally advertised in the barrel finishing field. Factory technicians will provide complete field engineering support. No objection to recognized non-competing lines. For consideration send complete resume of experience and personal background to Box No. 4256, PRECISION METAL MOLDING magazine.

DIE CASTING MACHINE IMMEDIATE DELIVERY—Brand new 150 ton zinc machine. 24" x 24" die plates, 10"-20" die space, 6½" plunger stroke, 500 pound melt pot capacity. Complete with furnace. Write Box No. 4356, PRECISION METAL MOLDING magazine.

FOR SALE—One HHP-ICC Lester die casting machine, serial 377—good condition—can be seen in operation. Lester Castings, Inc., 25661 Cannon Road, Bedford Heights, Ohio.

DIE CASTING ENGINEER—experienced in jobbing production work on aluminum die casting operations. Must be able to supervise all phases of die repair, die maintenance problems and production methods. Engineering background is preferred, but degree not necessary. This is a good opportunity for a young man experienced in the die casting field, who has the ability, energy and interest to join an expanding company. Write, giving age, education, experience and salary desired. All replies will be treated with strict confidence. Oswego Castings Corp., Div. of Oberdorfer Foundries, Inc., Oswego, N. Y.

MOLD DESIGNER—If you have a considerable amount of experience designing molds for the lost wax method in producing investment castings, we would like to explore with you, the several reasons why it may be to your advantage to become associated with the leader in this expanding field. Eastern location. Write Box No. 4456, PRECISION METAL MOLDING magazine.

For more information circle No. 12 on the Reader Service Card

AUTO-DIESEL PLUNGER RINGS

Last MONTHS not HOURS

You Get Over.. 100,000 *SHOTS Per Set*

A short time ago plunger rings were good for only a few hours. Auto-Diesel Engineers developed a new Hardened Steel Plunger Ring that will last for MONTHS instead of HOURS. IN MANY PLANTS THEY ARE GIVING OVER 100,000 SHOTS PER SET. (Names supplied upon request). They are made of cast iron, dieloy cast iron or hardened steel. Anyone operating die casting machines or casting zinc parts can save money. It will pay to write for details.

REDUCE EXPENSIVE REPAIRS

Use AUTO-DIESEL TWO or THREE PIECE Plunger Segment Rings

Cost of repairs and down-time can be greatly reduced by using Auto-Diesel 2 or 3 Piece Plunger Segment Rings. They are made of high grade wear resisting iron in sizes from 1½" to 4" by ⅜" especially for hot chamber and die casting machines.

Write for Details

THE AUTO-DIESEL PISTON RING CO.
3135 Superior Avenue • Cleveland 14, Ohio
"RINGS and SHAPES *Since* 1921"

Geography is no barrier to

Advance

Zinc and Aluminum die casting creative engineering

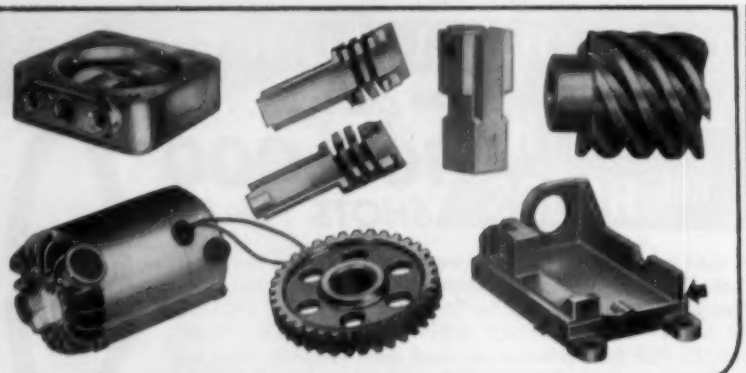
Manufacturers of fine appliances for homes, business and industry across the nation take their die casting problems to Advance. That extra measure of creative engineering and production skill Advance assures, can be yours, too.

Write or phone Advance today if you need

- to design new products
- to redesign existing products
- to improve your market position

ADVANCE TOOL AND DIE CASTING COMPANY
35 years of service to industry
3760 North Holton Street
Milwaukee 12, Wisconsin

For more information circle No. 3 on the Reader Service Card



DIE CAST PARTS *to Your Specifications*

A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

We Operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909

OPPORTUNITIES
continued from page 115

WANTED—One BH12 Kux hydraulic zinc die casting machine or its equivalent—die space of 12¼ x 12¼ and a die separation of 8 inches. Write Box No. 4556, PRECISION METAL MOLDING magazine

FOR SALE—40 KW Lindberg stationary aluminum melting furnace complete with panel and Wheelco Panelmount Capacitrol. Immediately available. Contact R. J. Thomas, Redmond Company, Inc., Owosso, Michigan.

ESTIMATING ENGINEER, investment castings, age 25-35 with machine shop, foundry or mechanical engineering training, not necessarily graduate. Must have thorough knowledge of precision investment casting manufacturing procedures and techniques. Usual company benefits. Salary commensurate with ability and experience. Please submit complete resume. All replies confidential. Hitchiner Manufacturing Co., Inc., Milford, New Hampshire.

Mr. Design Engineer:

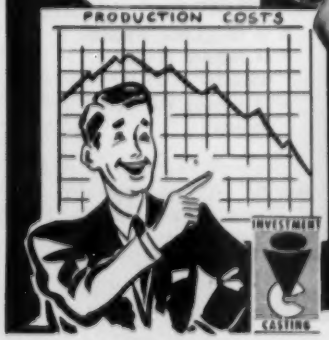
CHECK YOUR PRODUCTION CHARTS . . .

ONE PIECE INVESTMENT CASTINGS

Can CUT COSTS up to 59% — Do A Faster, Cleaner Job

ACCURATE CASTINGS

CLOSE TOLERANCES



Quality Control

Guaranteed work by virtue of complete inspection facilities: X-ray, Zyglo, Heat Treating, etc. Enjoy tremendous savings in time and money—cut 7-10 steps from machining operations alone. Milling and machining time are practically eliminated. You save on tooling, scrap loss and assembly time—up to 59% on one piece investment casting.

• Send blueprints or request personal consultation. No cost or obligation.

These pieces used in turbine flow meter work were formerly fabricated of several components, each now cast as an integral unit and used in the final assembly with a minimum of machining. Material is 400 series stainless steel.

ON REQUEST: We will be glad to send our brochure and all other data necessary to help you with your special casting problems.

FAST DELIVERIES ON ANY QUANTITIES

INVESTMENT CASTING CO.
60 BROWN AVENUE • SPRINGFIELD, N. J.
Write to Dept. A

For more information circle No. 53 on the Reader Service Card

SERVICE *IN ALL MELTING PROBLEMS WHERE FLUXES ARE USED*

PROVEN *USED BY DIE CASTING PLANTS FOR MORE THAN 15 YRS.*

New **SMOKELESS ZINC FLUX** *LATEST DEVELOPMENT*

ZINCOREX "DT"

has been improved to give your metal more fluidity and to prevent sluggishness. Zincorex "DT" does away with obnoxious ingredients, will not absorb water, reduces fumes. Application of Zincorex "DT" gives you:

1. Increased fluidity of metal
2. lower rejects and faulty castings
3. savings of metal (retained free of dross)

ALUCO "S"

is designed specifically for die casting aluminum base metals. With it, you can be sure of: reduced oxidation; removal of non-metallic inclusions; sound castings with minimum rejects.

Write for free samples and technical data.

Atlantic Chemicals & Metals Co.
1921-27 N. Kenmore Ave. • Chicago 14, Illinois

Circle No. 11 on the Reader Service Card

The 6 grades of Die Slick

Here is brief information on the six different grades of Die Slick—more detailed information will be sent on request.

No. 3—Aids parting and ejection on difficult ALUMINUM and MAGNESIUM castings. Non-staining. Enables better metal flow and fill-out of castings.

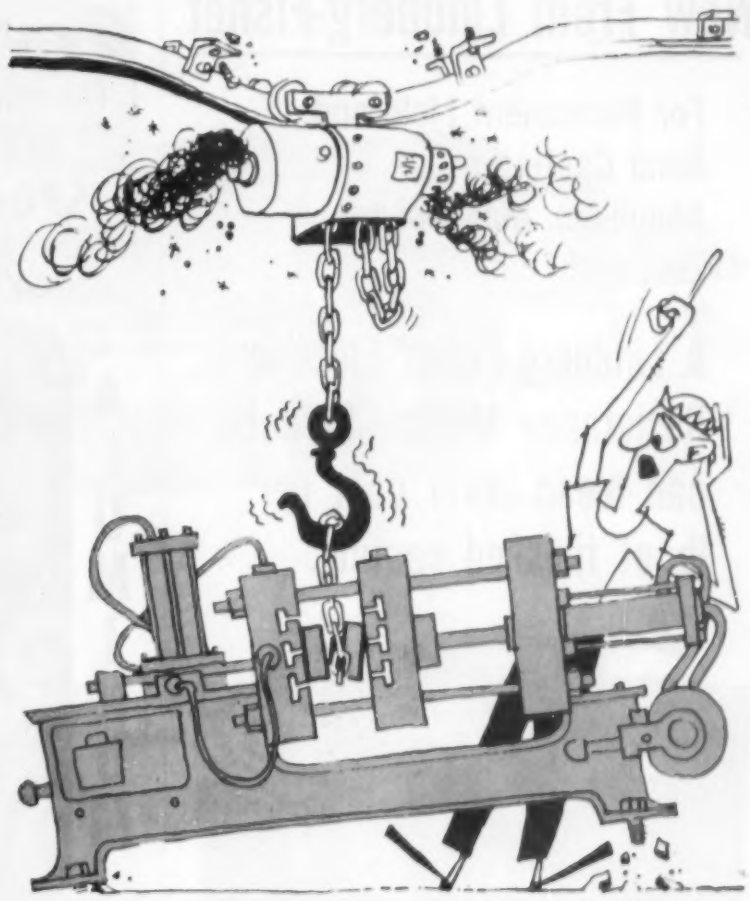
No. 4—Expressly for BRASS castings—sometimes used on aluminum and magnesium. Extra heavy-duty compound with lubricating graphite. Retains lubricity under high heat.

No. 9—For clean "hardware" finish ZINC castings, where finest plating results are required. Assures maintenance of clean cavities, cores, ejector pins, and guide pins.

No. 11—General purpose compound for ZINC castings. Generally stain-free unless applied too heavily. Prevents sticking and scoring.

SG—Standard grade compound for general use on ALL alloys except brass. A high viscosity amber fluid that is not readily burned off by the heat of the dies.

PS—Plunger-Slick is an adherent viscous compound that will not melt under highest casting temperatures. Expressly for cold chamber machines, it prevents scoring, sticking, or wear on plunger parts. No. 21—(silver) for average use on all alloys. No. 34—(black) has added micronized graphite for extra high lubricity.



Stop...use Die Slick to lower overhead!

Downtime from stuck die castings costs money, and so do rejects due to staining and poor surface finish. Die Slick puts an end to these, and to expensive die damage. Six grades of Die Slick—one for every die lubrication need—serve 80% of all diecasters . . . solve their toughest problems. Here's how you can prove it in your shop: send for a week's supply, specifying the type of metal or alloy you are casting. Use it on your most difficult jobs . . . pay for it only if you're completely satisfied.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC., 5400 KEMP ROAD, DAYTON 3, OHIO

For more information circle No. 92 on the Reader Service Card

New From Lindberg-Fisher

For Permanent Mold and Sand Casting of Aluminum, Magnesium, Zinc and Lead.

A Lindberg-Fisher Electric Resistance Melting Furnace can mean lower cost per lb. of finished casting.

These furnaces eliminate localized heating of metal, eliminate gas absorption, because there are no products of combustion present. Higher production results, due to less operator fatigue. Exhaust fumes and smoke are nonexistent and radiation loss is held to an absolute minimum by use of high quality insulation.

Longer crucible or pot service and low furnace maintenance are obtained with the patented long life, low voltage elements.

Can also be used as a holding furnace on die casting applications.

Write for Bulletin No. 320

We will have an interesting exhibit at the Casting Congress and Exhibit at Atlantic City. Please drop in.

LINDBERG FISHER **MELTING FURNACES**

A Division of Lindberg Engineering Company

2463 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

For more information circle No. 64 on the Reader Service Card

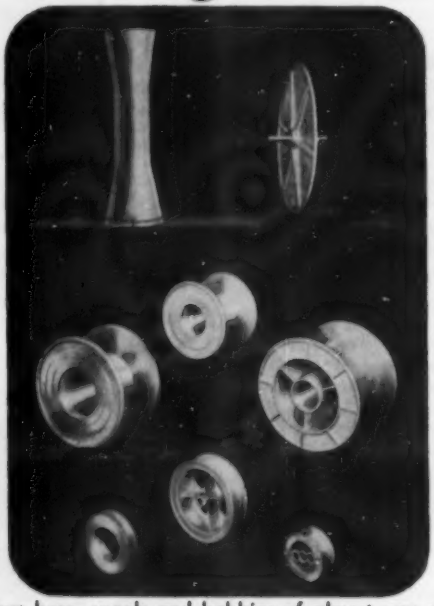
Greater Efficiency

for SHIPPING and PROCESSING TEXTILES and WIRE with

SPOOLS and BOBBINS

Die Cast IN

ALUMINUM



MAGNESIUM

As shown here, spools and bobbins of almost any size or design can be die cast by LITEMETAL in single units from aluminum and magnesium. Their efficiency and economy for the processing and shipping of wire and textiles has been proved. Our experience in manufacturing them is most extensive.

The die casting of parts from the new lightweight alloys—aluminum and magnesium—are practically limitless for uses and applications in almost every form where metal components are manufactured. The die casting process effects great savings in time and materials and virtually eliminates all costly labor otherwise required for machining and finishing. Important too are the savings in weight which often greatly reduce shipping costs and inplant handling.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

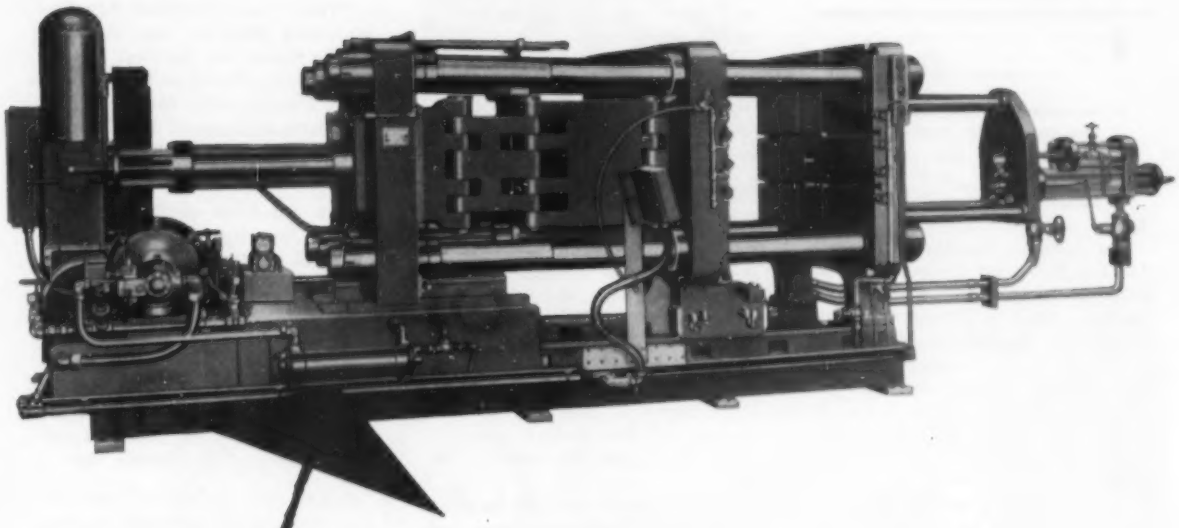
LITEMETAL DICAST Inc.

A DIVISION OF HAYES INDUSTRIES

1925 WILDWOOD AVE. · JACKSON, MICHIGAN

PLANT AND EXECUTIVE OFFICES

For more information circle No. 62 on the Reader Service Card



"TROUBLE-FREE ROSS EXCHANGER"

cools oil on this 750-ton Cast-Master

Designed to apply 750 tons locking pressure, this Model 40-A Cast-Master Die Casting Machine produces aluminum castings weighing as much as 11¾ pounds.

Installed as standard equipment, a rugged Ross Type BCF Exchanger provides constant cooling to maintain the correct oil viscosity. Thus, full capacity of the hydraulic power system is assured at all times.

Cast-Master engineers say: "In our experience, covering a period of years, we have found Ross Exchangers to be efficient and practically trouble-free."

Preferred by manufacturers of all types of hydraulic machinery, these compact, dependable, Ross Type BCF Exchangers are unsurpassed for thermal efficiency. They're pre-engineered and fully standardized in a wide range of sizes to meet every need.

For detailed information, request Bulletin 1.1K5.

ROSS

EXCHANGERS

ROSS HEAT EXCHANGER DIVISION
of
American-Standard
1446 West Avenue • Buffalo 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

For more information circle No. 6 on the Reader Service Card

DIE CAST ASSEMBLY

continued from page 35

7. Encasing a magnetic with a non-magnetic material;
8. Attaching a die casting to a shaft;
9. Mounting a jewel in its retainer.

On assembly operations, the die locates from the critical dimensions of the inserts. If a gear is to be assembled to a shaft, for example, the die locates on the two OD's, so that concentricity can be held very closely. A commercial concentricity tolerance is said to be .002, but can be held to the same tolerance as the OD's are machined.

Clearance between the individual members to be joined should be a minimum of .020 to assure good flow of metal and a strong bond.

Ordinary type metal is commonly used, although tin-antimony alloys or zinc base alloys are also used where their properties are desired.

Limitations on size: up to 12" diameter on a round piece, with shaft length projecting as much as 2" from one end and unlimited on the other end.

Maximum cavity volume on a small machine is .1 cubic inch, while the larger unit has a maximum cavity volume of .7 cubic inch.

Tooling: A Key Feature

Half the trick is said to lie in the tooling. Special methods of holding inserts positively have been developed, and dies are constructed for rapid operation.

Flash is automatically trimmed from the casting by a slight rotation of the die before ejection. Two tiny ribs provided on one surface of the casting are put there to engage the rotating die half.

Dies are precision built to close limits, with locating surfaces and slides hardened, ground and lapped.

Some of the unusual and money saving applications of this system of die cast assembly are illustrated. Each of them has solved what was previously a difficult production problem.

DESIGN ENGINEERING SHOW STRESSES NEW PRODUCTS

"Tomorrow's Products Are Tomorrow's Markets" has been set as the theme for the first Design Engineering Show, at Convention Hall, Philadelphia, May 14-17, it has been announced by Clapp & Poliak, Inc., New York, producers of the event.

The machine design division of the American Society of Mechanical Engineers will sponsor a conference on design engineering to coincide with the show.

Exhibits will include components, materials, finishes, shapes and forms, and services, which are used by design engineers to make end products for consumer and industrial use.

Conference topics will include cost reduction in product design, finding and training men for the design engineering field, selection of engineering materials, the effect of miniaturization upon design, compensating employees for inventions, and the rights of a company employee in inventions he develops.

QUALITY ALL THE WAY

A Michigan STANDALL metal is available to the precise characteristics you specify. Produced under rigid analytical and physical controls . . . inspection covers every phase of the alloying process to guard against impurities. Let a Michigan Standard sales representative help you . . . he is ready to promptly deliver—consistent high quality die casting metal. Call today.

ZINC ALLOYS FOR DIE CASTING
ZINC ANODES FOR ELECTROPLATING
Special and Standard Alloys

MICHIGAN
STANDARD ALLOYS SALES CO., INC.
Products of
MICHIGAN STANDARD ALLOYS, INC.

MICHIGAN STANDARD ALLOYS SALES CO., INC. • BENTON HARBOR, MICHIGAN

For more information circle No. 72 on the Reader Service Card

We Are The First Custom Die Caster Licensed to Produce

VACALOY
VACUUM DIE CASTINGS

Open time available for Zinc and Aluminum die castings. Your standard existing die casting die can be used. We can lick these casting problems for you:

- **Chromium plating blistering**
- **Porosity exposed by machining**
- **Lack of pressure tightness**
- **Blistering under heat**

We are now producing an aluminum vacuum die casting for a steam iron sole plate with cast-in electric heating element for a major appliance manufacturer.

Write for more information. Your inquiries invited.

the VACUUM DIE CASTING CORP.

990 East 67 St., Cleveland 3, Ohio

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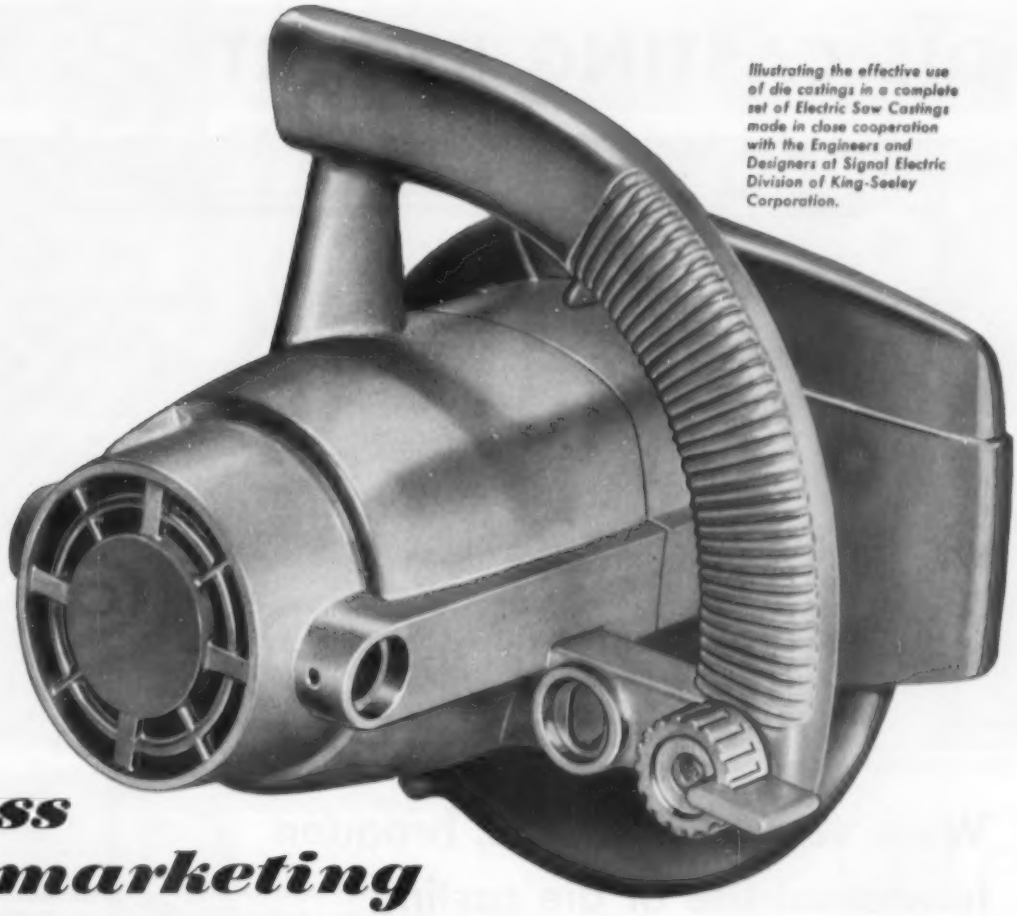


Illustrating the effective use of die castings in a complete set of Electric Saw Castings made in close cooperation with the Engineers and Designers at Signal Electric Division of King-Seeley Corporation.

mass marketing wisdom

with MADISON-KIPP zinc and aluminum die castings

A PRODUCT having instant and striking eye appeal sells more readily than one with a clumsy looking design. It sells better but probably not on "looks" alone. The buyer, consciously or unconsciously, may quickly conclude that good looks are combined with more thoughtful engineering—and he is right in such an evaluation.

To upgrade your product you may find that the skilled and seasoned mechanics at Madison-Kipp can be very helpful. Many highly placed engineers and designers have found this to be true for over a quarter of a century.

Please clip this ad as a reminder to contact us when you have die casting requirements.

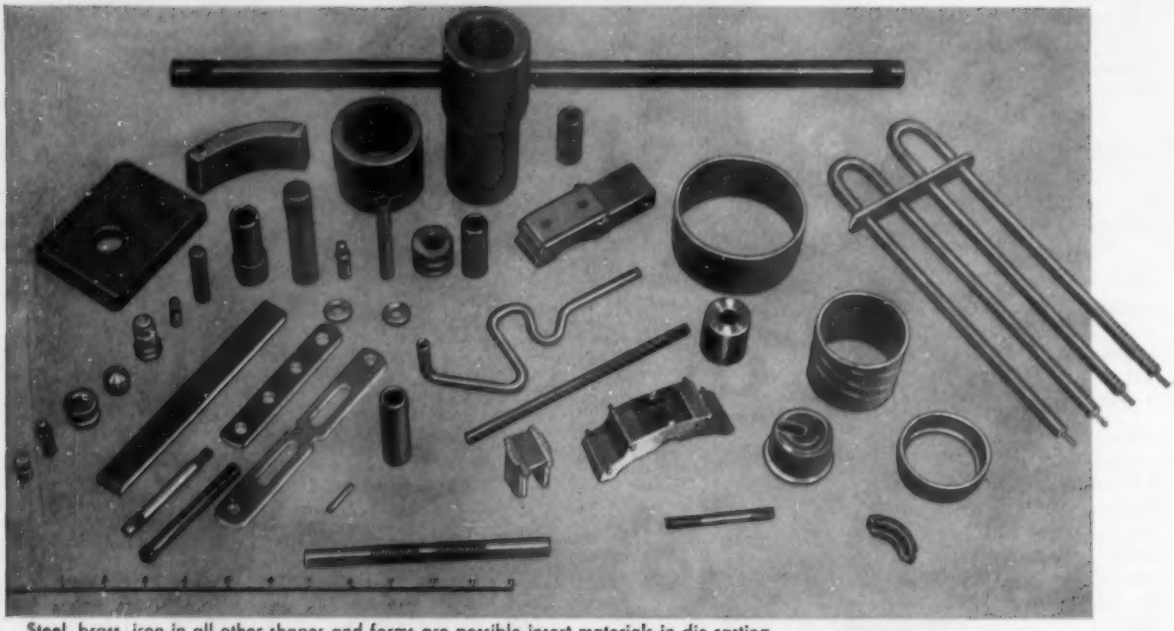
kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U. S. A.

Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

For more information circle No. 65 on the Reader Service Card

DIE CASTING REPORT

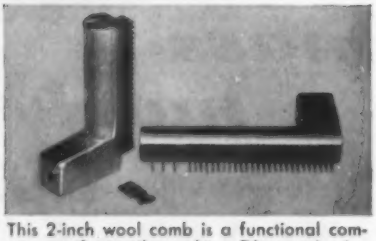


Steel, brass, iron in all other shapes and forms are possible insert materials in die-casting.

Wide variety of inserts, broaden functional use of die casting

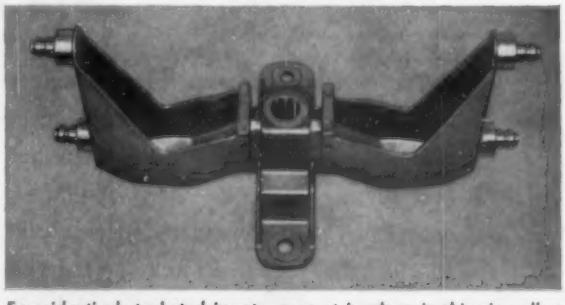
The intelligent use of inserts has done much to extend the versatility of die-castings. Some idea of the wide variety of insert materials commonly used in products and components may be gained from the above photo. Steel, brass, and iron (in bar stock, tubing and stamped form) are represented. Even wood has been successfully inserted, and a laminated assembly may be seen in the foreground. Cal-Rod inserts may be seen, too, as well as irregularly bent tubing and common bearing surface inserts. Here are new design possibilities for product engineers seeking ways and means of lowering production costs, without sacrificing functional efficiency.

PRECISION is a national, *integrated* die-casting company, capable of serving your company from product design stages through to assembly and shipment of complete products. Write us for more detailed information. Address: Precision Castings Co., New Business Dept., 222 Walnut St., Fayetteville, New York.



This 2-inch wool comb is a functional component of a textile machine. **Die-cast** in zinc it has 26 steel blade inserts; also cast in aluminum with 29 inserts.

One of the common types of small inserts: The knurled brass threaded insert shown here. This piece measures only 3½ inches outside diameter.



Four identical steel stud inserts are cast in place in this zinc alloy platen toggle frame assembly measuring 12 inches overall. This is a functional unit of a business office machine.

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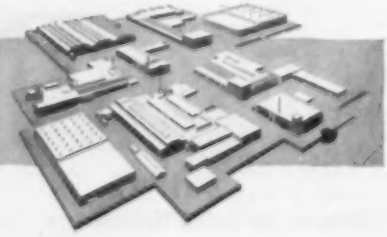

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NEWS OF INDUSTRY AND ASSOCIATIONS

USE OF POWDERED METAL COMPONENTS HIGHLIGHTS M.P.A. MEETING IN CLEVELAND

PROGRAM for the 12th Annual Meeting of the Metal Powder Association will be held in Cleveland April 10-12 at the Hotel Cleveland. In conjunction with these sessions, the 1956 Metal Powder Show will be held, with exhibits by producers of powders, fabricated parts and equipment.

Meetings on Tuesday, April 10, are business sessions open only to members of the Metal Powder Association. The Metal Powder Show, however, is open to the public on that day.

Complete program and time schedule of the technical meetings follows:

Wednesday Morning, April 11

10:00 A.M. AGE-HARDENABLE BRASS POWDER ALLOYS
E. A. Anderson and E. H. Rennhack, The New Jersey Zinc Co.

10:45 A.M. THE USE OF SINTERED PARTS IN IBM PRODUCTS
Athan Stosuy, International Business Machines Corp.

11:30 A.M. REPLACEMENT OF CASTINGS BY POWDER METALLURGY
T. L. Robinson, Powdercraft Corp.

Wednesday Afternoon, April 11

2:00 P.M. APPLICATION OF POWDER METALLURGY IN NUCLEAR ENGINEERING
H. H. Hausner, Nuclear Engineering Div., Penn-Texas Corp.

2:45 P.M. POWDER METALLURGY IN THE ELECTRICAL AND ELECTRONICS INDUSTRIES
A. S. Doty, P. R. Mallory & Co., Inc.

3:30 P.M. THE APPLICATIONS OF FERRITE AND IRON POWDER ELECTRONIC CORES
C. E. Cherry, Jr., Metal Powder Association

3:50 P.M. PANEL DISCUSSION ON SINTERED STRUCTURAL MATERIALS
J. M. Copeland, Moderator, International Business Machines Corp.
Medium Density — Robert Talmage, Consultant
High Density — W. J. Doelker, Globe Industries
Infiltrated Parts — C. G. Johnson, The Presmet Corp.

Thursday Morning, April 12

9:30 A.M. INFLUENCE OF LUBRICATION AND DIE SURFACE ON THE PRESSING CHARACTERISTICS OF METAL POWDERS
Ivan Ljungberg and P. G. Arbstedt, Husqvarna Vapenfabriks AB

10:15 A.M. ALUMINUM POWDER METALLURGY PRODUCTS (APMP)
J. P. Lyle Jr., Aluminum Company of America

11:00 A.M. CERAMIC-METAL FRICTION MATERIALS
L. D. Hower, Jr., Raybestos Div., Raybestos-Manhattan, Inc.

11:45 A.M. THE MANUFACTURE AND APPLICATIONS OF HEAVY ALLOY
J. F. Kuzmick, Welded Carbide Tool Co., Inc.

AL BREMBLE JOINS CLEVELAND SMELTING FIRM

Alfred J. Bremble has been appointed as eastern sales manager of both Certified Alloys Company and of Aluminum Smelting and Refining Company, Inc., of Cleveland, Ohio, it has been announced.

Mr. Bremble will direct the sales of zinc based die casting alloys and aluminum alloys in

Alfred J. Bremble

Ohio and Pennsylvania as well as the eastern seaboard, the announcement said.

Closely identified with the die casting industry and a pioneer in its early sales and development, Bremble was associated with the New Jersey Zinc Sales Company of New York City for 29 years. During the last five years he served as assistant manager of that company's Metal Division.

ZINC INSTITUTE MEETS

The American Zinc Institute will hold its 38th annual meeting at the Hotel Statler, St. Louis, Mo., on Monday and Tuesday, April 23 and 24.

The program for Monday, the first day, will include reports on the general outlook for 1956, the outlook for zinc and zinc-coated steel, zinc pigments and zinc in cathodic protection, the role of planned publicity in marketing metals, and zinc market developments in the United States and Europe.

The Tuesday morning program

will feature world lead and zinc supplies and requirements, zinc and lead mining, the effects of technical developments in creating new markets, and Washington observations.

INVESTMENT CASTERS MEET IN NEW YORK MAY 9-11

The Investment Casting Institute will hold its annual Spring Meeting at the Hotel New Yorker, New York City, May 9 through 11. Highlight of the three-day meeting will be the regularly scheduled technical sessions which will be held on Thursday, May 10. Dr. Nicholas J. Grant, associate professor of metallurgy, Massachusetts Institute of Technology, and technical consultant to the Institute, will deliver a paper on "Decarburization During Casting And Heat Treatment;" Geoffrey Paget, superintendent of the Investment Casting Division, Deloro Stellite, Belleville, Ont., will report on the techniques of producing high strength steel castings.

The technical sessions will also include a panel on recent experiments with vacuum melting. In addition, Adam Dunlop of the Shaw Process Development Corp. will prepare a special paper, and as a special service to members, will moderate a Gating Clinic during which time manufacturers present may indicate various gating problems for analysis and recommendation.

FORM DIE CASTING FIRM

Charter of incorporation has been issued to the firm of Hadlock & Temte, Inc., Winfield, Ill., which will specialize in the production of small zinc die castings.

Officers of the corporation are Harold W. Hadlock, Naomi Hadlock, Estelle Temte and Bernard H. Temte.

ROGER WAINDLE FILLS LIAISON POST, CASTING UNIT, COMMERCE DEPT.

Roger F. Waindle, president, Wai-Met Engineering Co. has been appointed chief, Casting Branch, Iron and Steel Division of the Business and Defense Services Administration, Department of Commerce.

This, and similar positions in the Business and Defense Services Administration (BDSA), are rotated each six months among top industry executives to provide a two-way communication between government and industry.

Waindle will be on loan from his positions as vice president, The Misco Corporation; and president

Roger F. Waindle

of Wai-Met. He is chairman, Metal Specifications Committee, and member of the Research Committee of the Investment Casting Institute; he is former board chairman and president, American Society of Tool Engineers.

A graduate registered professional engineer, Waindle was chief engineer of the Fahralloy Company, and became general manager of Alloy Engineering and Casting Company. He co-founded Cannon-Muskegon Corporation of which he was vice president and director.

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GEORGE E. KAUFMAN HEADS HOOVER DIE CASTING SALES

Promotion of George E. Kaufman, staff engineer in the engineering division of the Hoover Company, to sales manager of its commercial die casting division, has been announced by the company effective March 1.

Mr. Kaufman succeeds Harold L. Scharver, a Hoover employee of many years, who has resigned for other work.

George E. Kaufman

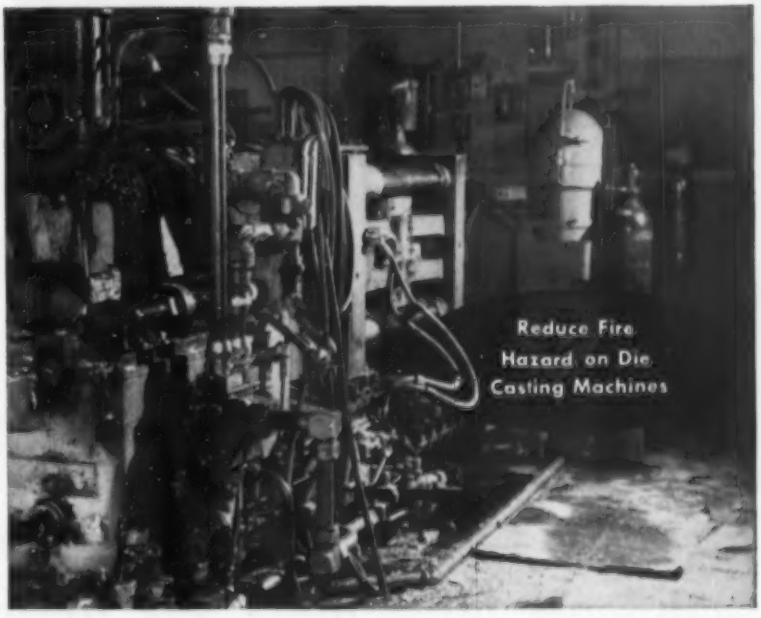
Kaufman joined the Hoover Company in September, 1945, as a junior engineer. He was advanced to the rank of senior engineer in December of 1952, and about a year later was further advanced to staff engineer. His most recent assignment has been to handle the engineering coordination involved in creating Hoover's new automatic handmixer, which will appear on the market this spring.

He is a mechanical engineering graduate of the University of Akron, 1944. Prior to joining Hoover, he was with the Goodyear Aircraft Corp. as a tool designer for about two years.

WILLIAM JOBBINS, INC. SOLD TO GROUP

Announcement of the change in stock ownership of William F. Jobbins, Inc., has been made by the company.

Following a vote of the stockholders of Acme Aluminum Alloys, who previously were the sole owners, the aluminum smelter at Aurora, Ill., was sold to a group headed by present management consisting of: C. V. Cooper, president, R. K. Arundle, vice president, and J. L. Stumm, secretary-treasurer. These officers will continue to operate in the same respective capacities without any change of management.



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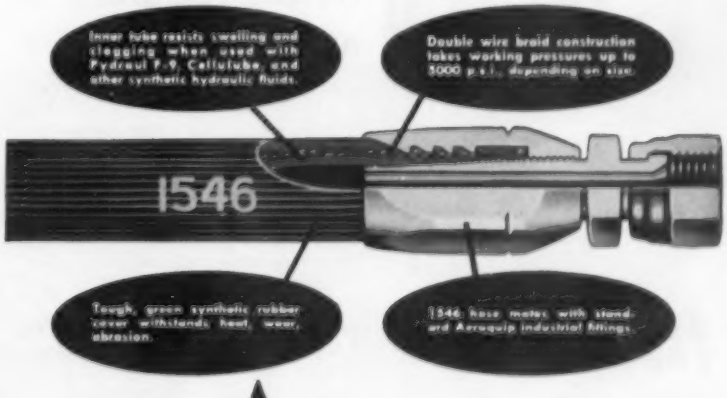
A small inventory of Aeroquip bulk hose and reusable fittings can meet all your needs because replacement lines can be made by plant personnel, using ordinary hand tools. Installation takes only a fraction of the time needed to form and fit rigid tubing.

Check your Yellow Page Directory for your Aeroquip distributor, or write us for Bulletin 157.


Inner tube resists swelling and clogging when used with Pydraul F-9, Cellulube, and other synthetic hydraulic fluids.
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Huskvarna
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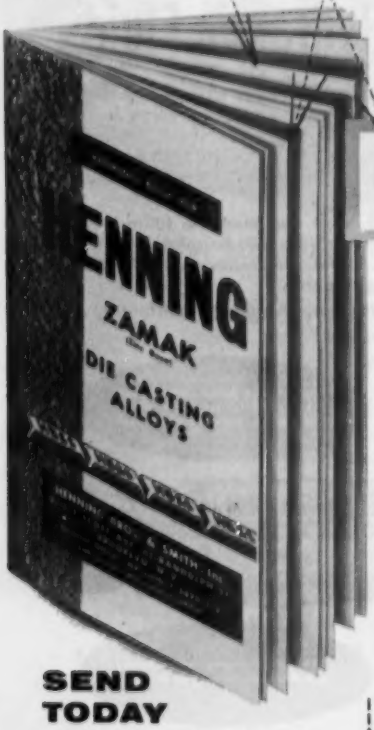

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POINTS TO BE LUBRICATED: the axle bearings for the four-wheeled pattern carriage; pivots for the two hitch mounts, one at each end of the carriage; and the link pins of the roller chain. Wheels must run freely, and hitches must drop snugly into place in the drive chain.

A veteran foundryman tells how he gets

Proper Lubrication For Shell Mold Machines

By EARL W. JAHN, President Production Pattern & Foundry Co.

IT'S a rough life for the bearings of the pattern carriages on our shell molding machines.

Twenty-four hours a day, shift after shift, day after day, every minute and a half these carriages shuttle back and forth the eight and a half feet from curing oven to investing box. After 30 to 50 seconds at the shell mold baking temperature of 900 F., the carriages move to the relatively cooler temperature of about 400 F for the same length of time during the second half of the cycle; then back to 900 F.

It takes three-shift operation of our five shell molding machines to turn out enough molds to keep ahead of the casting floor, where pouring goes on only one shift a day. We must have dependable, uninterrupted service from these machines.

There are three critical friction points that require, and get, special lubrication attention. These are: the axle bearings for the four-wheeled pattern carriages; the pivots for the two hitch-mounts, one at each end of the carriage, which hook into the roller chain that propels the carriage back and forth across the bed of the machine; and the link pins of the roller chain. Wheels must turn freely and smoothly, and the hitches must drop snugly into place in the drive chain in order for the shell molding machine to deliver uninterruptedly.

From the outset of our work in

HORIZONTAL POURING of a medium-section gray iron casting in shell mold needs no weights or supports, but in vertical pouring, the molten metal has enough head pressure to burn through the back of an unsupported shell.

VERTICAL POURING, reserved only for special jobs, requires special mold support. This manifold casting has a 1/32" tolerance on smoothness and straightness of the cored hole.

SHELL MOLD LUBE—Cont.

shell molding some six years ago, we have carefully followed the recommendations for lubrication of these vital points made by the designers of the machines, Shell Process, Inc. The axle bearings—cast iron segment-type friction bearings — and the pivot points are lubricated regularly, once a day, with a mixture of 'Oildag', a colloidal graphite dispersion in petroleum oil made by Acheson Colloids Co. and "D.T.E. No. 10" oil, in the proportion of one to five. Link pins of the roller chain are lubricated every 12 hours with the same mixture.

The high temperature encountered in shell molding emphasize the need for a lubricant that is economical, heat resistant, and odorless. Conventional lubricants used under high-temperature conditions in the past have included high-viscosity oils or heavy greases produced by thickening liquid petroleum compounds with metallic soaps.

Such products, however, are often victims of high heat. Petroleum oils exposed to shell-molding temperatures decompose or volatilize; greases distill off, leaving a residue of non-lubricating soap. On the other hand, the colloidal graphite retains its lubricating properties even when subjected to high temperatures or pressures.

We use concentrated 'Oildag', having a 10 percent solids content. The petroleum carrier insures even distribution of particles over the whole bearing surface. At the high temperatures prevailing in the shell-mold baking ovens, the petroleum carrier evaporates leaving a low-friction "graphoid" film as a permanent lubricant.

Proper Lubrication Contributes To Automation

This film is much more resistant to rupture than a film formed with oil alone. It is finer, denser, and more tenaciously absorbed to the bearing surface than a coating produced by powdered graphite. Only prolonged or heavy abrasion can remove or destroy the film; it resists oxidation, discourages corrosion, eliminates sticking, reduces friction, and prevents binding of the linkage.

To produce shell castings most profitably, automation has been introduced into this foundry layout to the utmost extent possible. Sand storage and sand-resin mixing equipment are located on a flat above the shell-molding machines, where it requires only about half the time of one man to mix a sufficient supply of sand and phenolic resin to keep our five automatic shell-making machines operating at full capacity. Each of these machines turns out a shell mold every 1 to 1½ minutes.

The machines themselves have an automatic sand-feed attachment built in to the upper portion of the investing box. When the sand in the box reaches a predetermined level, the inlet to the box is automatically coupled to the outlet from a chute leading from the storage bin above the machine. Additional mix is then admitted to the box to provide sufficient volume and weight for the gravity drop to properly invest the hot pattern plate. Vertical drop of the sand onto the surface of pattern is the surest way to obtain molds of suitable density on any pattern contour.

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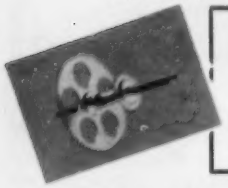

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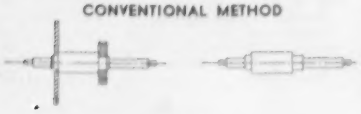
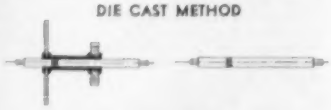
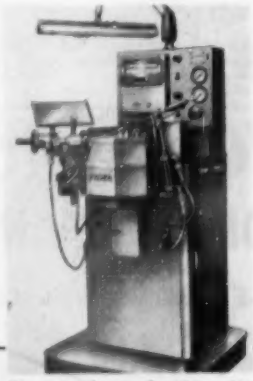


DIE CAST METHOD



An overall cost reduction of 80% resulted from changing this assembly from staking to die casting. The shaft was greatly simplified. The need for concentricity between center hole and periphery of gear was eliminated. Two gears are die cast in position in a *single operation.*

Send for data on the assembly of gears and other precision components on the Fisher No. 16 assembly die casting machine.



No. 16 takes only 30" x 30" floor space, weighs 950 lbs. Features: semi-automatic operation, up to 600 assemblies per hour. So safe that girl operators may be employed.

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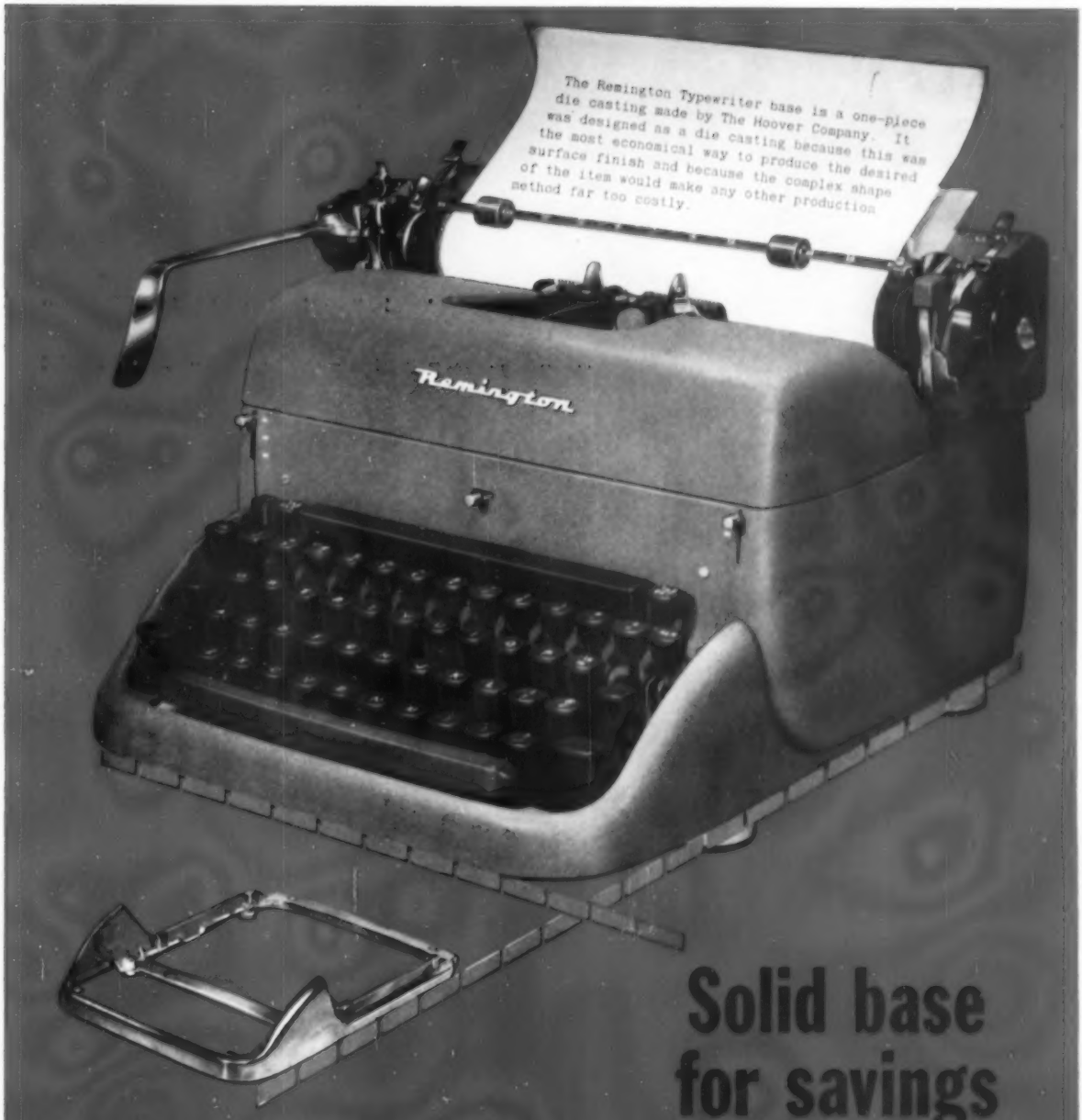
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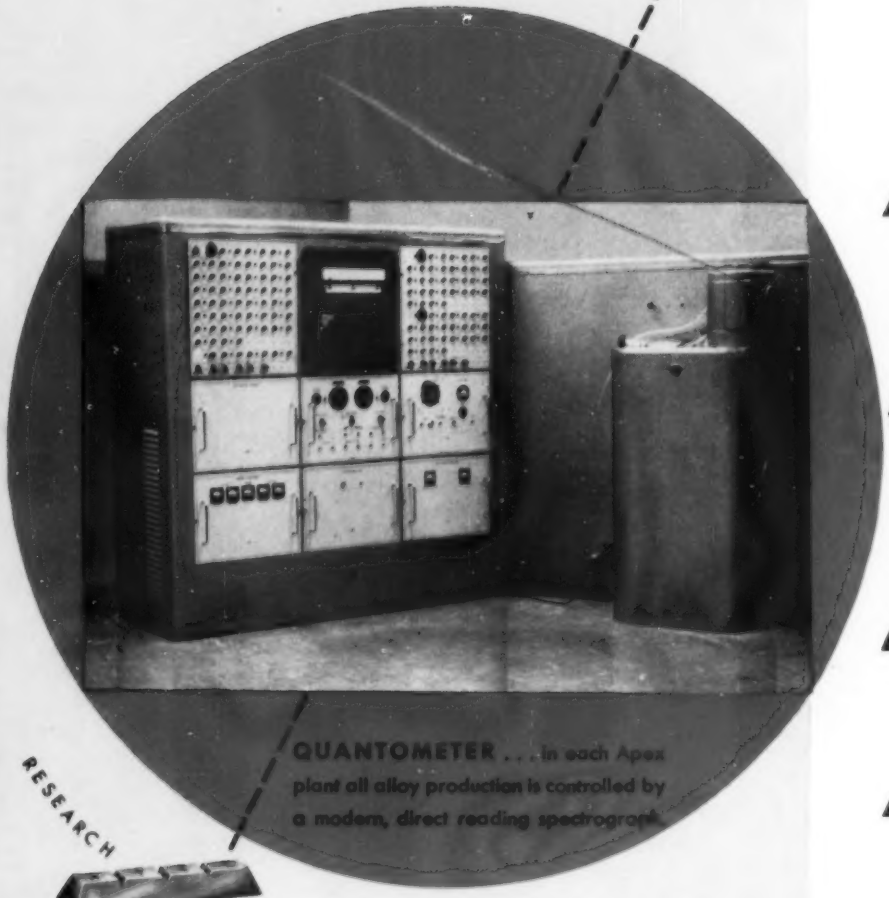

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